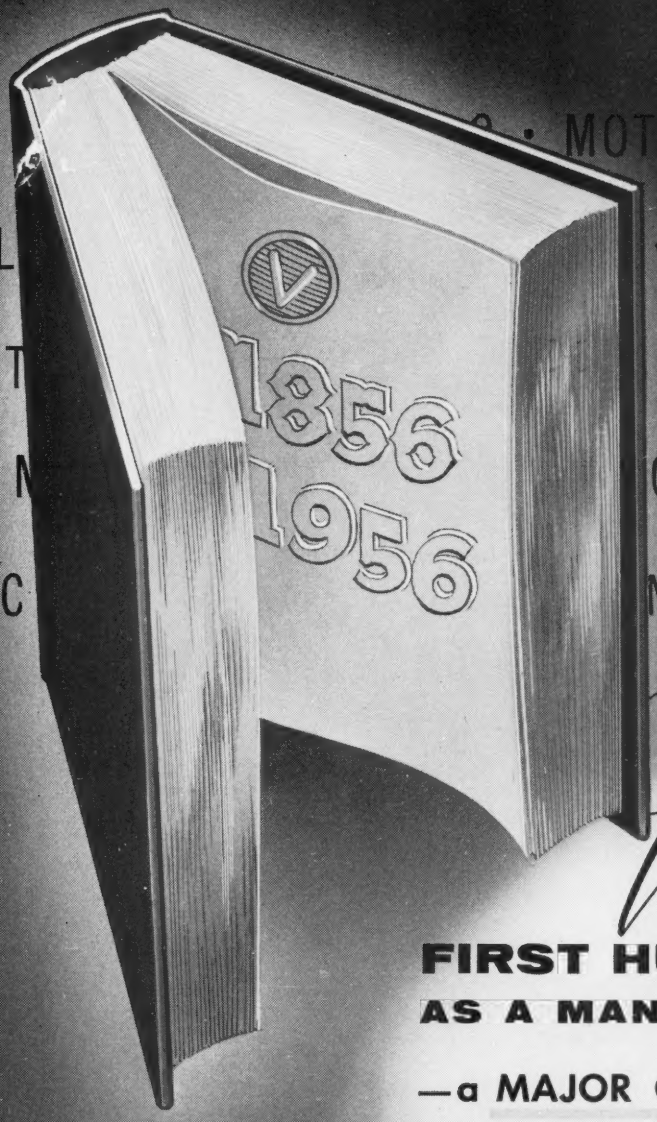
WIRE AND WIRE PRODUCTS

OCTOBER 1956



BLOX · MOTOBLOX · RINGBLOX · MOT
NGBL · MOTOBLOC · MOTOBLOX
· MOT RINGBLOX · MOTOBLOC ·
OX · M OC · MOTOBLOX · RINGBL
OBLOC NGBLOX · MOTOBLOC · MO

Vaughn's®

FIRST HUNDRED YEARS AS A MANUFACTURER

—a MAJOR CHAPTER in the History of the Wire Drawing Industry since 1871 . . .

See pages 1192 A-B-C-D

V®

The VAUGHN MACHINERY CO., CUYAHOGA FALLS, OHIO, U.S.A.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

PICK Payoffpak®

in fibre

or steel

whichever is best for you

PAYOFFPAK
FIBRE DRUM

PAYOFFPAK
STEEL PAIL

The Payoffpak system is the easiest, cheapest way to pack, ship, store and use wire. Make it yours—in fibre or steel, or both.

ONLY CONTINENTAL GIVES THIS CHOICE OF PACKAGING FOR WIRE

Now you can use the Payoffpak system of loading and shipping wire . . . and, for smaller units, you can choose a fibre or a steel package, whichever best meets your requirements. Our steel Payoffpak pails give airtight protection, have sturdy bails and necked-in bottoms for secure stacking. Along with rugged construction, our fibre Payoffpaks offer the economy that goes with light weight. Smaller size has handy handles. Also available in various larger sizes.

With Payoffpak, wire is loaded directly into the shipping container as it is drawn or coated . . . laborious operations of splitting, tying and wrapping are eliminated. Payoffpaks can be beautifully decorated to become a traveling advertisement for you.

CONTINENTAL CAN COMPANY
100 E. 42nd St., New York 17
SALES OFFICES IN ALL PRINCIPAL CITIES

THE MANUFACTURERS OF

"America's Finest Wire Drawing Lubricants"

Cordially invite you to spend your "leisure" hours with us in Suite 468-470 at the Penn-Sheraton Hotel during The Wire Association Convention, Oct. 28th through Nov. 1st.

We have planned many things for your enjoyment.

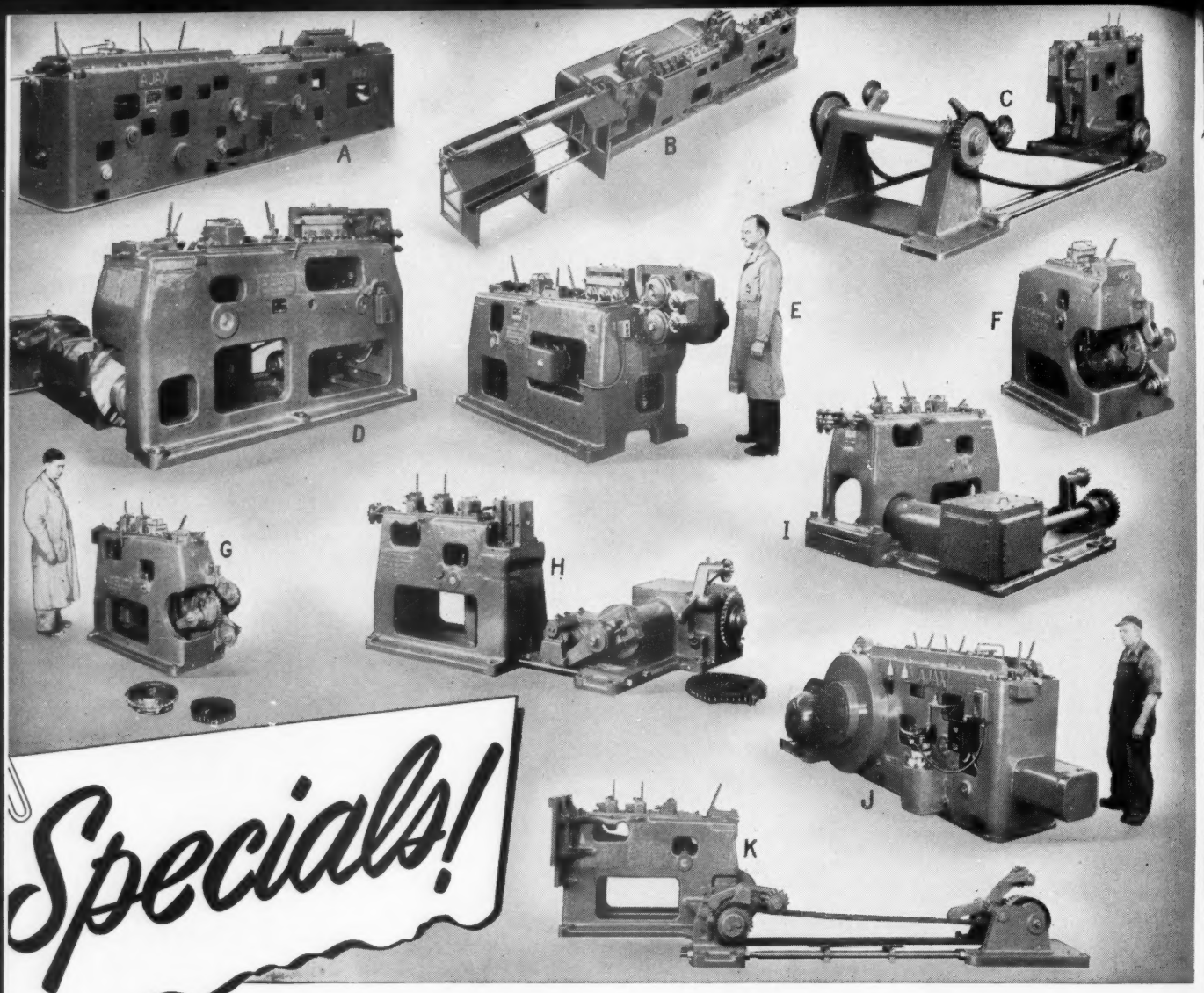
Standard Industrial has pioneered in most of the outstanding contributions to better wire drawing through better lubricants. Consult Standard Industrial for the solution of your difficult problems.

Standard Industrial
COMPOUNDS CO., INC.

FRANKFORT, ILLINOIS

(A suburban Chicago area city)

Telephones: 2131-2141



In addition to a complete line of standard wire drawing and bar drawing machines, Ajax designs and manufactures special drawers to meet a wide variety of special requirements. Whether the need is for round, square, hex., keystone or rectangular section stock to close tolerances or whether the drawer is to be used in conjunction with cold headers, presses or special machines, Ajax can build it to meet the requirements and at a cost consistently low for the size and quality of the machine produced. If you have a need for drawing ferrous metals from 1010 to 52100 or non-ferrous metals with enough hardness to permit gripping, which is beyond the range of one of our standard drawers our engineers will be glad to discuss your particular requirement with you. We will be glad to send further information.

- **A** Bar Drawing and Straightening Machine
- **B** Drawing, Straightening and Cutting off Machine
- **C** for Drawing Keystone Stock
- **D** for large Waterbury-Farrel Nut Machine
- **E** for ½" Nut Machine
- **F** for ¼" Waterbury Header
- **G** for ⅜" Waterbury Header
- **H** for No. 5½ Minster Press
- **I** for Double End Spoke Header
- **J** Continuous Drawing Machine
- **K** for ⅝" Bolt Maker

AJAX METAL WORKING MACHINES

Forging Presses • Forging Machines • Forging Rolls

Ajax-Hogue Wire Drawers

THE AJAX MANUFACTURING COMPANY CLEVELAND 17, OHIO

110 S. DEARBORN ST., CHICAGO 3, ILL.

W. P. WOOLDRIDGE CO. • BURLINGAME, CAL. • LOS ANGELES 22, CAL.

now, Crucible low nickel stainless steels that meet many of your needs . . .

Here are two *new* Crucible grades, Rezistal type 201 and 202 that are similar in quality and properties to types 301 and 302 . . . but with desirable features all their own.

In the annealed condition, for example, Rezistal 201 and 202 have about 10% higher strength than 301 and 302, yet maintain almost identical ductility. This means that these grades can be fabricated with ease equal to their counterparts. In addition, their mill finishes and corrosion resistance to a wide variation of media compare most favorably with 301 and 302.

To sum up: Rezistal 201 and 202 have practically all the desirable properties of 301 and 302, *plus* some of their own. And they're available *promptly* in all forms. Write now for data sheets fully covering the properties of these new stainless grades. *Crucible Steel Company of America, Dept. A.W.W., The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

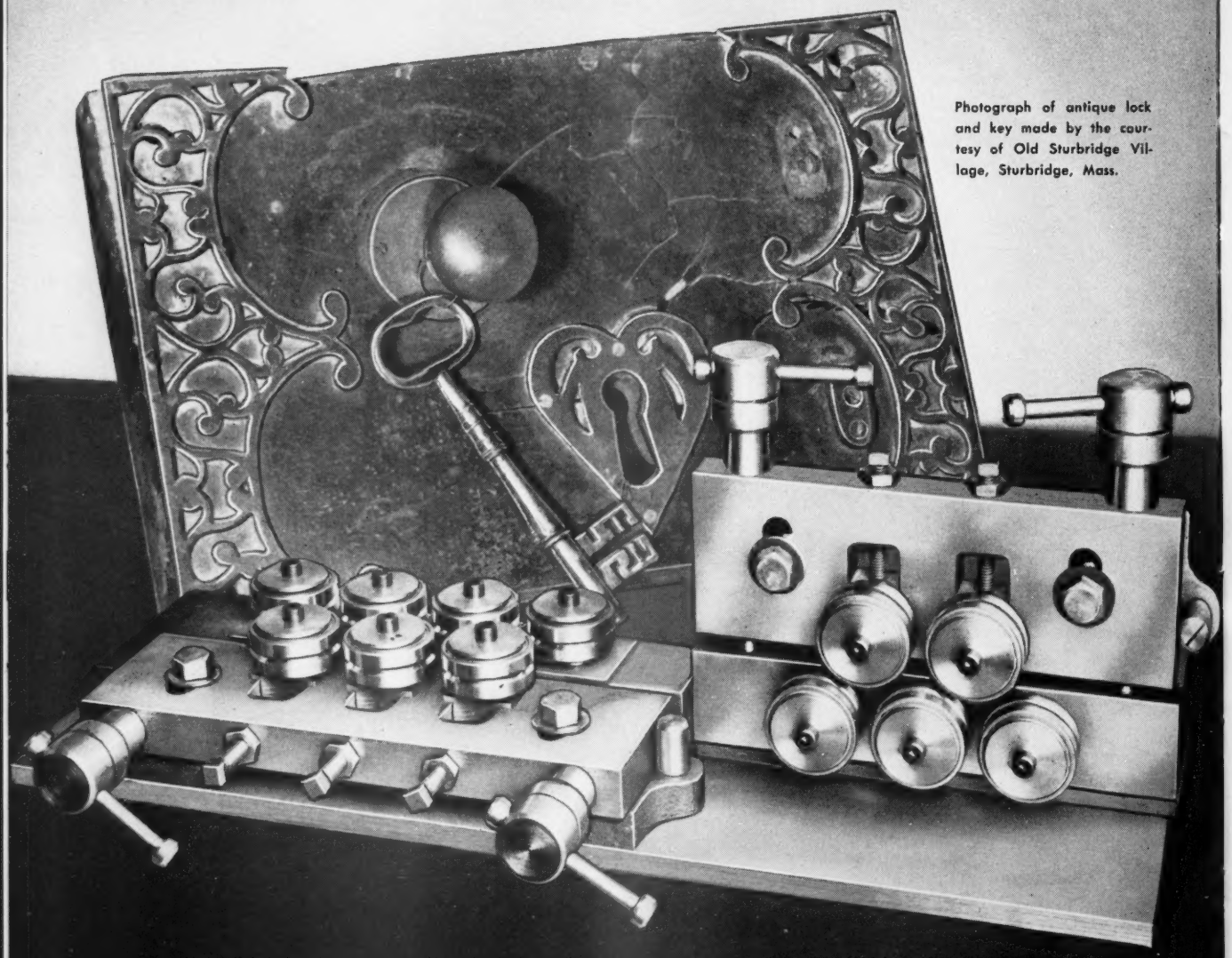
Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

Sjogren WIRE MILL TOOLS

Used By Wire Men Who Want the Best!

C R A F T S M A N S H I P



Photograph of antique lock and key made by the courtesy of Old Sturbridge Village, Sturbridge, Mass.

A functional designed Sjogren two-plane straightener typifies the present day product as compared with that of the early nineteenth century, dramatically demonstrated by the ornamental filagree created on the face-plate of a door lock made by some unknown Yankee workman more than a century ago. Each product displays craftsmanship of the highest order. Every Sjogren wire mill tool is designed and manufactured under exacting standards to insure production of quality; masterpieces in their own right for heavy day to day use.

SJOGREN TOOL AND MACHINE CO., INC.

Tools for the Wire Industries

14 SWORD STREET, AUBURN, MASSACHUSETTS

WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 31 October, 1956 No. 10

Designated as Official Publication By The Wire Association

Contents

Editor's Desk 1153

Electromatic Oil Tempered Wire
by George A. Sweitzer 1155

Hot Dip Wire Aluminizing Processes and Alloys
by J. D. Sprowl 1160

The Steel Wire Industry in Australia
by James Kenneth MacDougall 1164

Measurement of Electrical Conductor Characteristics
by L. F. Roehmann 1180

Automotive Zigzag Spring Wire
by Webster J. Van Horn 1184

Certain Aspects of the Operation and Maintenance of the Properzi Continuous Casting and Rolling Mill
by V. G. G. Nayar and K. R. K. Nair 1187

The Progress of the Properzi Process
by Frank R. Nichols 1193

Drawing Quality Aluminum Wire
by O. L. Burtenshaw and Richard E. Hutchinson 1197

The Use and Selecting of Wire For Thermocouples
by Marvin R. Danielson and Raymond E. Thompson 1199

Continuous Production Electroplating of Tin on Copper Wire Using Alkaline Potassium Stannate Bath
by M. K. Schurter and R. T. Gore 1201

Introducing the Nailmaker
by Richard J. Fisher 1205

The Effect of Salts in Formvar On the Dielectric Properties of Formvar Alkyl-Phenolic Coated Magnet Wire
by Robert E. Kass and Edward Lavin 1207

Spiral Wrapping Machines and Materials
by Harold A. Myers 1212

Copper and Copper-Alloy Wire For Mechanical Purposes
by Theodore E. Veltfort 1213

Plasticizers for the Wire and Cable Industry
by William C. Goodwine 1215

Silicone Insulated Conductors
by Donald F. Christensen 1217

Wire Association Annual Convention Program 1223-1226

Government Wire Production Information 1229

Outstanding Personalities of the Wire Industry 1237

A Review of Recent Wire Patents 1245

Index to Advertisers 1282-1283

Where-To-Buy 1284-1288

WIRE and WIRE PRODUCTS is indexed regularly by Engineering Index, Inc., New York, N. Y.

RICHARD E. BROWN, President and Publisher

R. S. Spengel, Secy.-Treas. & Gen'l. Manager
J. Edward Donnellan, Vice-President

Edmund D. Sickels, Editor

— ASSOCIATE EDITORS —
Lancaster, Allwine & Rommel, Consultants on Patent Information

Publication Office: Jersey City, N. J.
Executive Office: 453 Main St., Stamford, Conn.
* Reg. U. S. Pat. Off.

WIRE & WIRE PRODUCTS, Vol. 31, No. 10, October, 1956. Publication Office at One Sherman Avenue, Jersey City, N. J. Executive Office 453 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Sec'y and Treas. Subscription Price: U. S. $8.00; Canada, $8.00 per year; Domestic 75 cents per copy; Foreign 90 cents per copy, except October Convention Issue and January Proceedings Issue, $1.25 per copy; Foreign $10.50 per year. Entered as second class matter at the Post Office, Jersey City, N. J. under the act of March 3, 1879.

Copyright, 1956 Quinn-Brown Publishing Corp.

Scott Printing Company, Jersey City 7, New Jersey

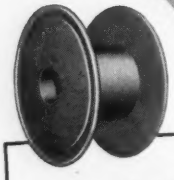
• The top production rates designed into your machines are yours to profit by when you call upon Hans C. Bick for modern lubricants, coolants, and cutting fluids. Manufactured by specialists with 23 years' experience, these compounds are engineered for rigorous conditions such as high feeds, speeds and pressures. Furthermore, you'll like the friendly manner in which our engineers cooperate to solve the toughest problems. To get the most from your machines and tools, always call upon Hans C. Bick to smooth and cool the way.

Hans C. Bick, INC.

READING, PENNSYLVANIA

Worth looking into . . .

APCO MOSSBERG STEEL REELS AND SPOOLS



Get the full facts on the complete Apco Mossberg line!

See us at the

ANNUAL WIRE ASSOCIATION CONVENTION

Penn-Sheraton Hotel

Pittsburgh October 29-November 1

Pacific Coast Representative:
Gordon Proffitt
Room 501-503
24 California Street
San Francisco 11, Calif.

Canadian Representative:
Hugh P. Williams & Co.
47 Colburne Street, West
Toronto, Ontario, Canada

You can save time and money by making Apco Mossberg your one-stop "shopping headquarters" for top quality, steel reels, spools and bobbins in all types and sizes. Whatever your requirements—standard or special—Apco Mossberg can fill the bill!

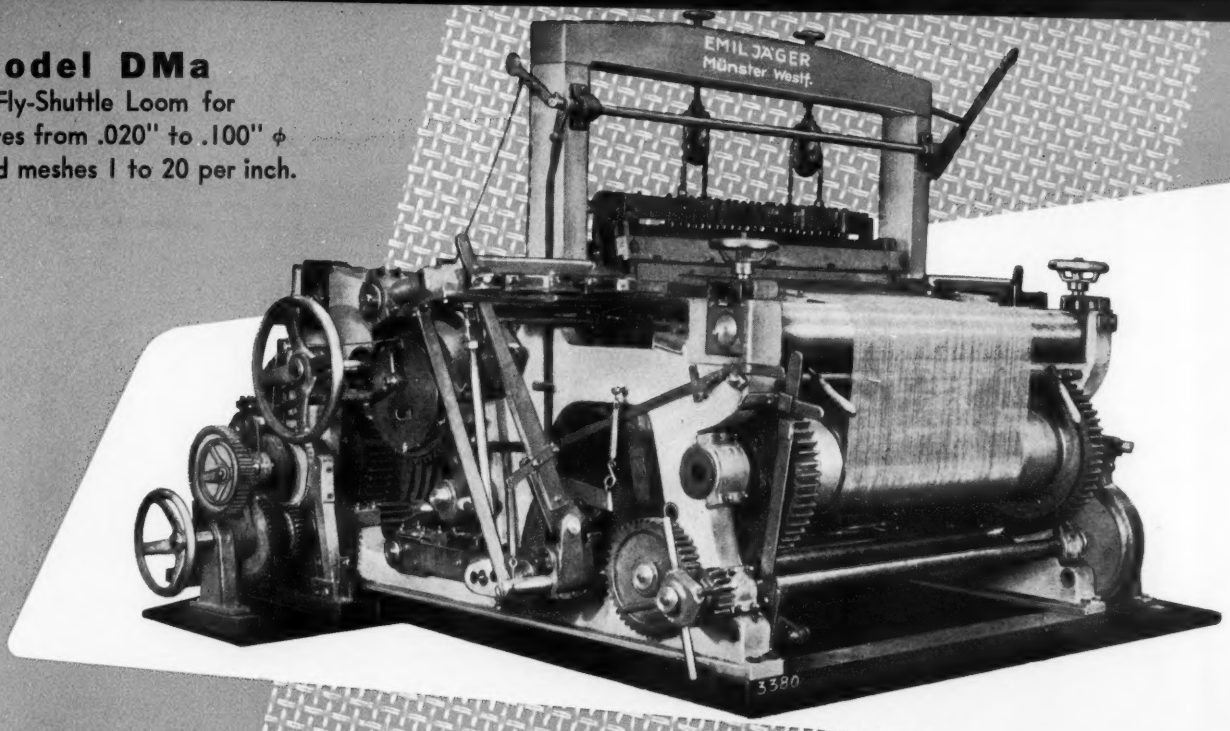
- Flat Head Spools
- Curled Flange Spools
- Stranding Reels
- Take Off Reels
- High Speed Wire Drawing Reels
- Vulcanizing and Insulating Reels
- Pressed Steel Bobbins For Wire Weaving

WRITE FOR FREE CATALOG!

APCO MOSSBERG COMPANY

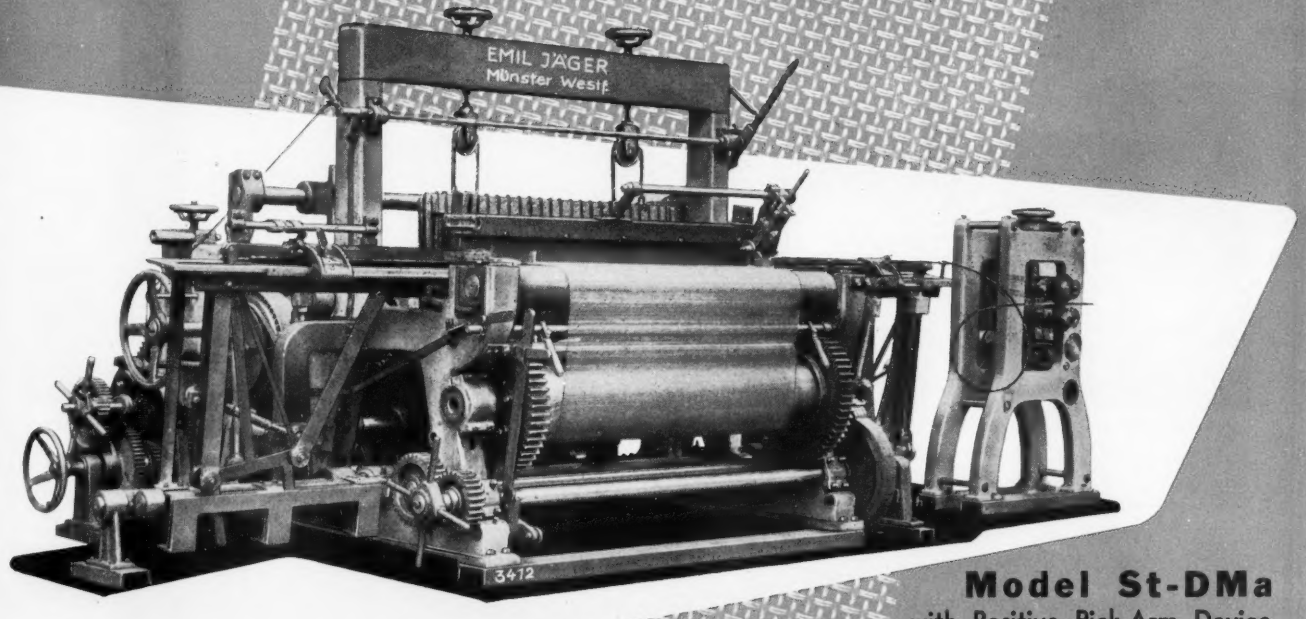
LAMB STREET, ATTLEBORO, MASSACHUSETTS

Model DMa
a Fly-Shuttle Loom for
wires from .020" to .100" ϕ
and meshes 1 to 20 per inch.



JAEGER

Wire Weaving Looms—Weaving width 40 to 80 inches

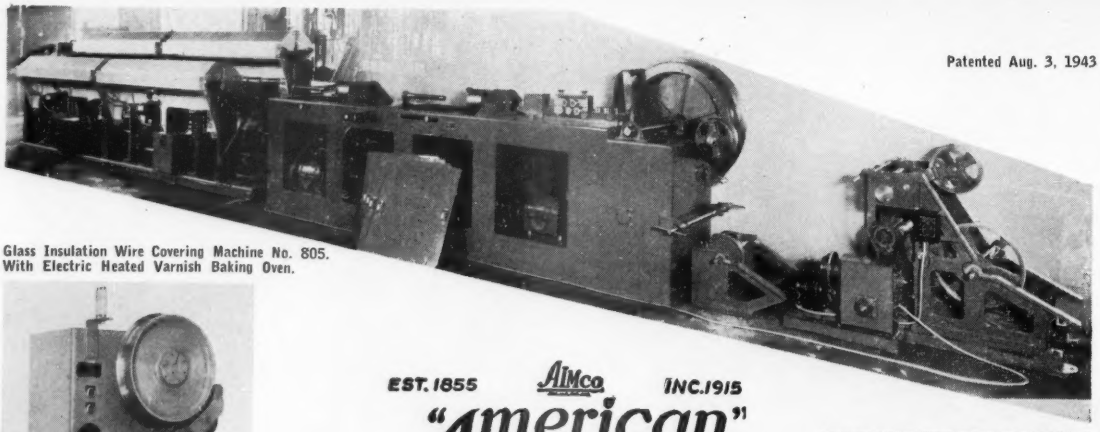


Model St-DMa
with Positive Pick-Arm Device
and synchronized Crimping Machine to
feed pre-crimped shoot wire direct from
crimper automatically into the shed of the loom
For high tensile wires from .020" to .100" diameter

Sole Representatives for U. S. A. and Canada

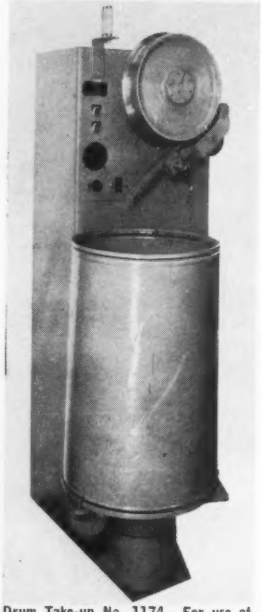
CEDAR-WEST TOOL COMPANY, INC.

Tel.: REctor 2-1520 — 88-90 West Street • New York 6, N. Y.



Patented Aug. 3, 1943

Glass Insulation Wire Covering Machine No. 805.
With Electric Heated Varnish Baking Oven.



Drum Take-up No. 1174. For use at the Enameling Operation. Also built in multiple units.

EST. 1855 AIMCO INC. 1915

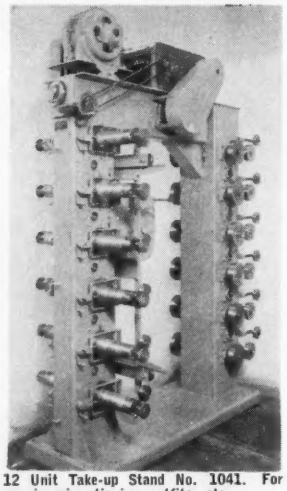
"American" AIMCO INSULATING MACHINERY COMPANY

REG. U.S. PAT. OFF.

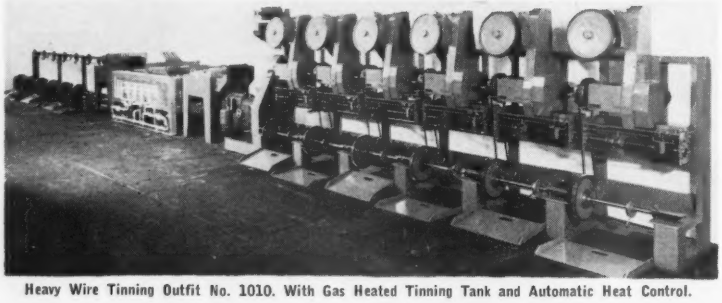
FAIRHILL AND HUNTINGDON STREETS

PHILADELPHIA 33 PENNSYLVANIA U.S.A.

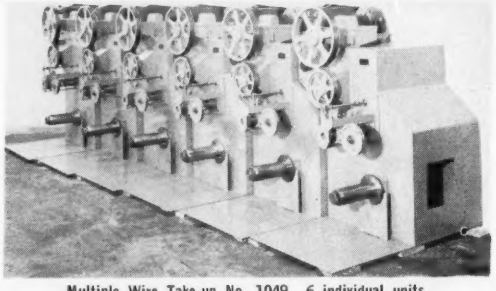
WE SPECIALIZE IN MACHINERY FOR:
WIRE DRAWING, ENAMELING,
TINNING, INSULATING, TAPING,
GLASS-COVERING, PANNING,
AND ALLIED MACHINERY



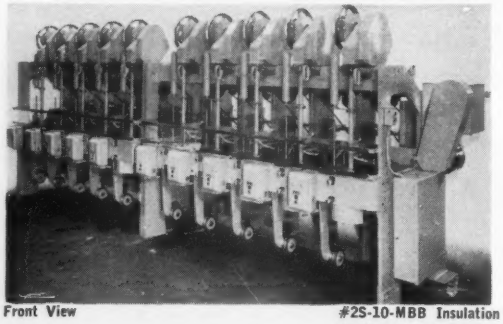
12 Unit Take-up Stand No. 1041. For use in wire tinning outfits, etc.



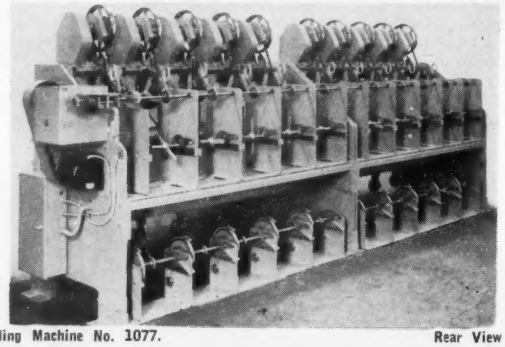
Heavy Wire Tinning Outfit No. 1010. With Gas Heated Tinning Tank and Automatic Heat Control.



Multiple Wire Take-up No. 1049. 6 individual units, each Reel-arbor torque motor driven. For use in wire tinning outfits, etc.



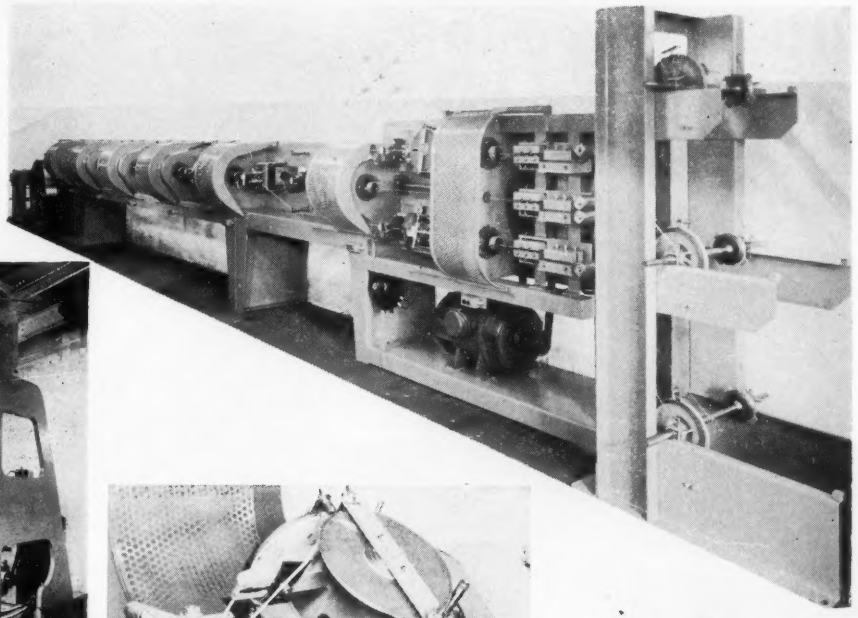
Front View

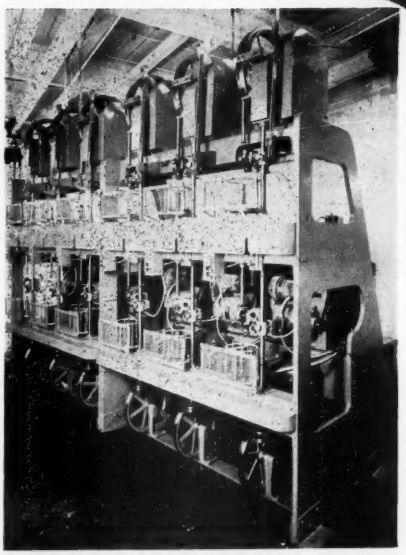


#2S-10-MBB Insulation Winding Machine No. 1077.
Applies a single cover to 10 lines of wire.

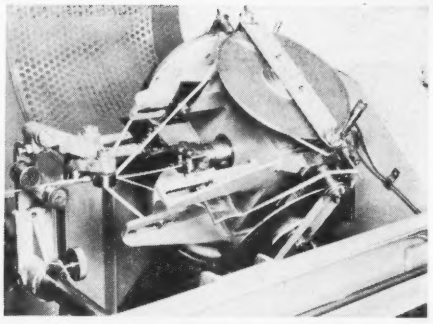
Rear View

4 M-T-BB Taping Machine No. 1105. Arranged for individual wire double taping, then combining and multiple tape covering.





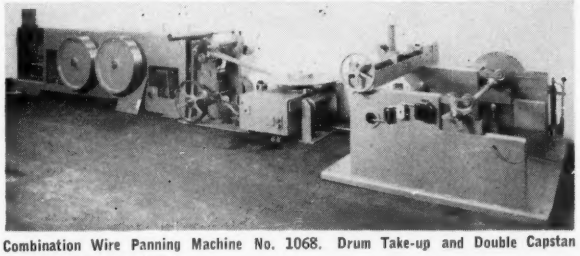
Double Taping Machine No. 1107. Applies 2 tapes to each of 6 round or flat wires.



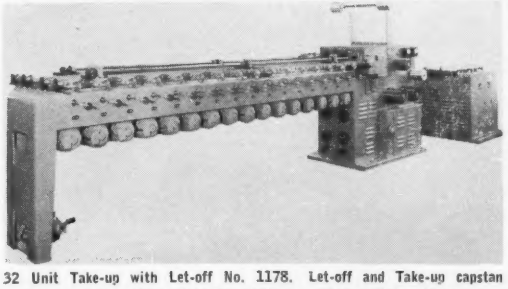
Quadruple Taping Head No. 889.

"American" INSULATING MACHINERY COMPANY

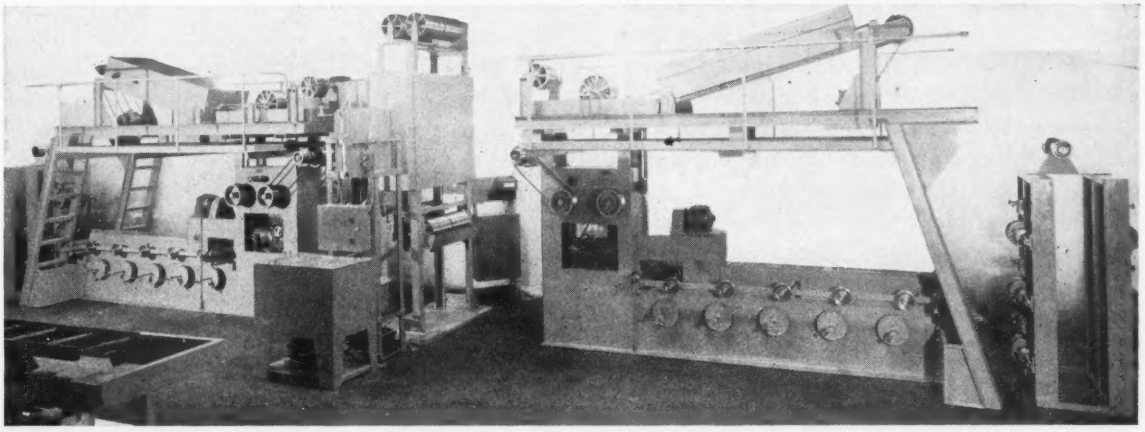
REFER TO NUMBERS



Combination Wire Panning Machine No. 1068. Drum Take-up and Double Capstan with Adjustable Speed Drive.



32 Unit Take-up with Let-off No. 1178. Let-off and Take-up capstan speeds are synchronized. Take-up spindles are Torque Motor driven.



Wire Enameling Machine outfit No. 997. With Pre-annealer, Storage, Circulating and Filter System for Enamel. Oven is higher than shown and is shortened to show top sheaves.

WIRE WITH A TIGHT BOND OF PURE ZINC FIGHTS RUST...

summer

Campbell furnishes "Inco" pattern coil chain of weldless design to builders of quality gym sets and backyard swings. The bright sparkle of the bethanized zinc coating adds sales appeal besides protecting against rust.

and winter

This handy chain applier, made from bethanized wire, is clamped on the tire, the ends of the chains are hooked to the prongs, and the car is moved forward. Campbell tire chains are also made from Bethlehem steel.

It's bethanized wire. And like so many users, Campbell Chain Company, York, Pa., a leading chain manufacturer, finds bethanized ideal for wire products that must withstand severe forming and still have more than ordinary rust-resistance.

In making weldless chain of double-loop design, Campbell has no trouble with the zinc cracking or flaking off in the forming and knotting operation. For example, they use 12-gage bethanized wire of medium temper for making size No. 1 of their "Inco" pattern. The finished chain is smooth, easy on the hands. And it has the bright sparkle so typical of bethanized wire. Most important of all, the pure zinc coating is intact even on the severe twists.

The bethanized coating is locked on, atom by atom, by our unique electrolytic process. Thanks to this tight bond, plus the purity of the zinc, the coating is highly ductile and can stand severe forming. Twist it, wrap it, weave it—even draw it through dies—and the pure zinc armor stays put.

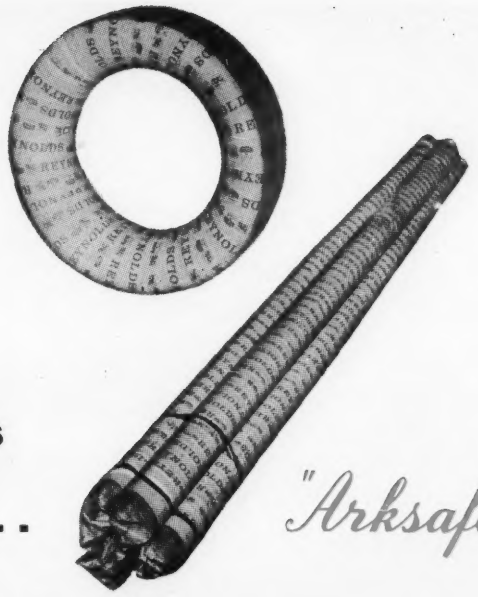
We offer a choice of four standard coating weights to meet a variety of service conditions. If you're looking for a tightly bonded, uniform coating and dependable resistance to corrosion, you'll like bethanized wire. And it costs very little more than ordinary galvanized wire. Our nearest sales office will gladly arrange a trial shipment.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

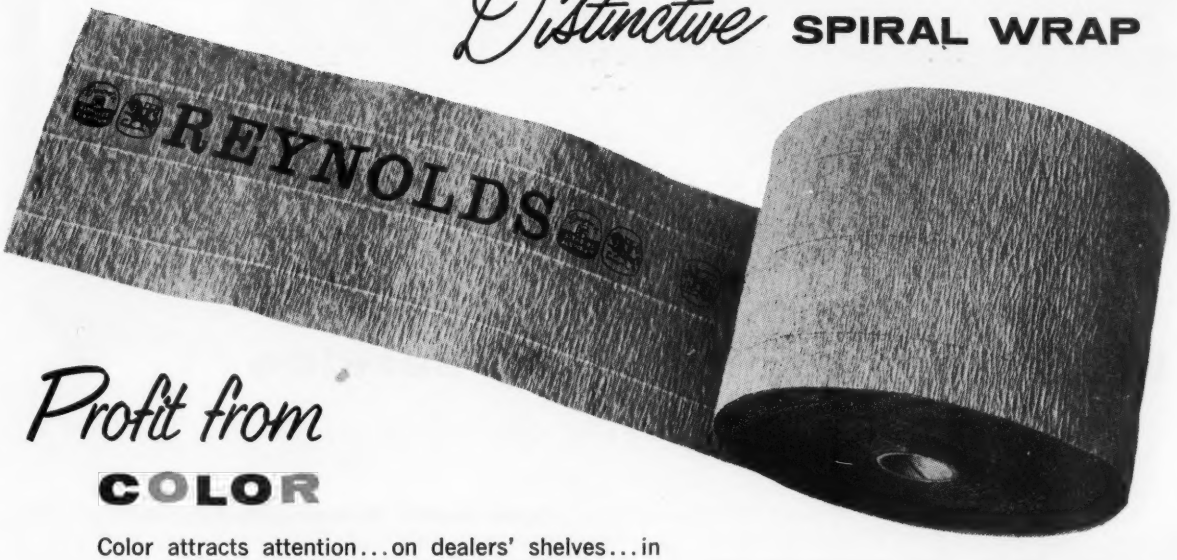


REYNOLDS

fine quality products protected by...

"Arksafe"

Distinctive **SPIRAL WRAP**



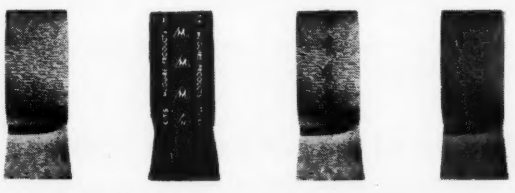
Profit from

COLOR

Color attracts attention...on dealers' shelves...in advertisements...most important to you, when customers see colorful wrappings on your products in their storerooms and on their production line.

It costs little to have color added to any construction of "Arksafe" spiral wrap. In addition to printing in any combination up to four colors there are also colored papers.

can be used on your present wrapping equipment

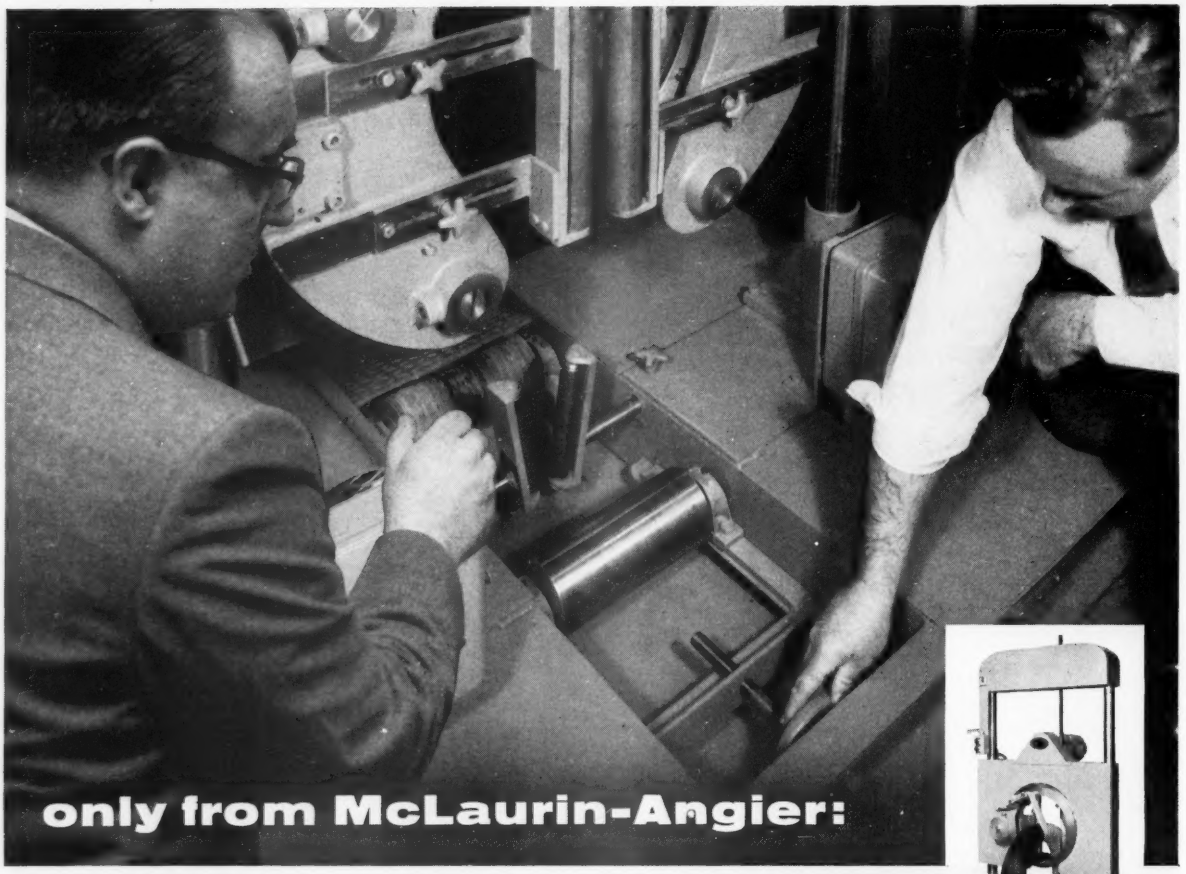


ARKELL SAFETY BAG COMPANY

10 EAST 40th STREET NEW YORK 16, N. Y. (Est. 1896) 6345 WEST 65th STREET CHICAGO 38, ILLINOIS

Plants: Chicago, Illinois · Newport News, Virginia

WRITE TODAY FOR MORE DETAILED INFORMATION



Engineered spiral wrap service

that keeps your packaging operation at peak efficiency!

Only from McLaurin-Angier the assurance of speedy, *personalized* service for your spiral wrap operation! Our engineers are available *when you need them* to solve spiral wrapping problems . . . to train machine operators . . . to repair out-of-order equipment. They're as close as your telephone — and their job is to assist *you at your plant.*

Only from McLaurin-Angier, *to meet exact packaging needs*

Spiral wrap equipment

- New UW-10 for medium duty wrapping with no-lift, floor loading feature
- W series machines for heavy duty wrapping of coils 12″ (I.D.) and up
- Bench model machines for wrapping semi-rigid coils and straight lengths
- Custom made tension and folding devices

Spiral wrapping papers *

- Creped reinforced waterproof papers
- Creped reinforced non-asphaltic papers
- VPI corrosion inhibiting papers

**Your firm name and trade mark may be printed on all Spiral Wrap papers to your specifications*

At the Wire Show Oct. 29–Nov. 1 see M-A Spiral Wrap equipment in action–**Parlor E and F,** Penn-Sheraton Hotel.

M–A

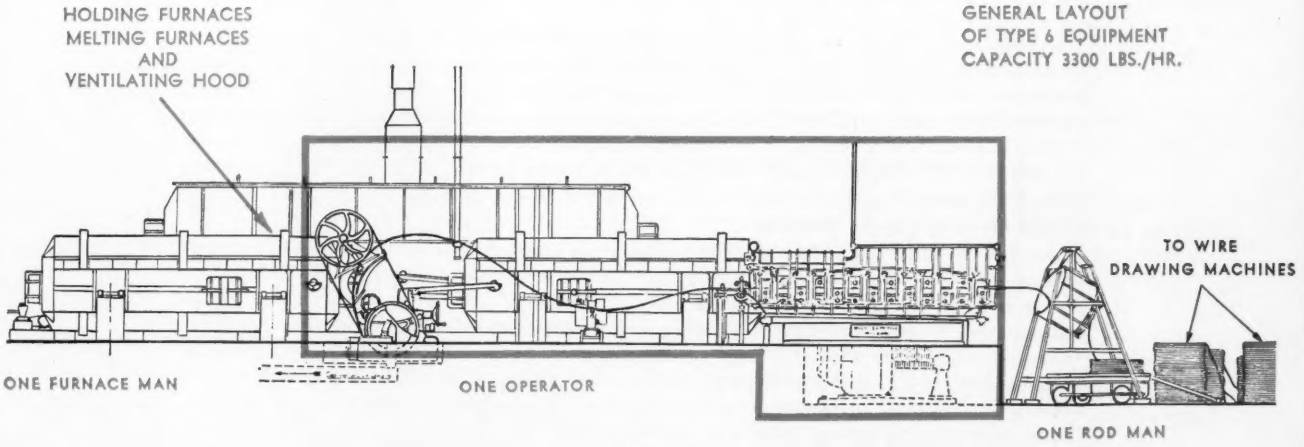
McLAURIN-ANGIER CO.
Needham Heights, Massachusetts
(phone Needham 3-5400)

molten aluminum to redraw rod

THE PROPERZI PROCESS . . .

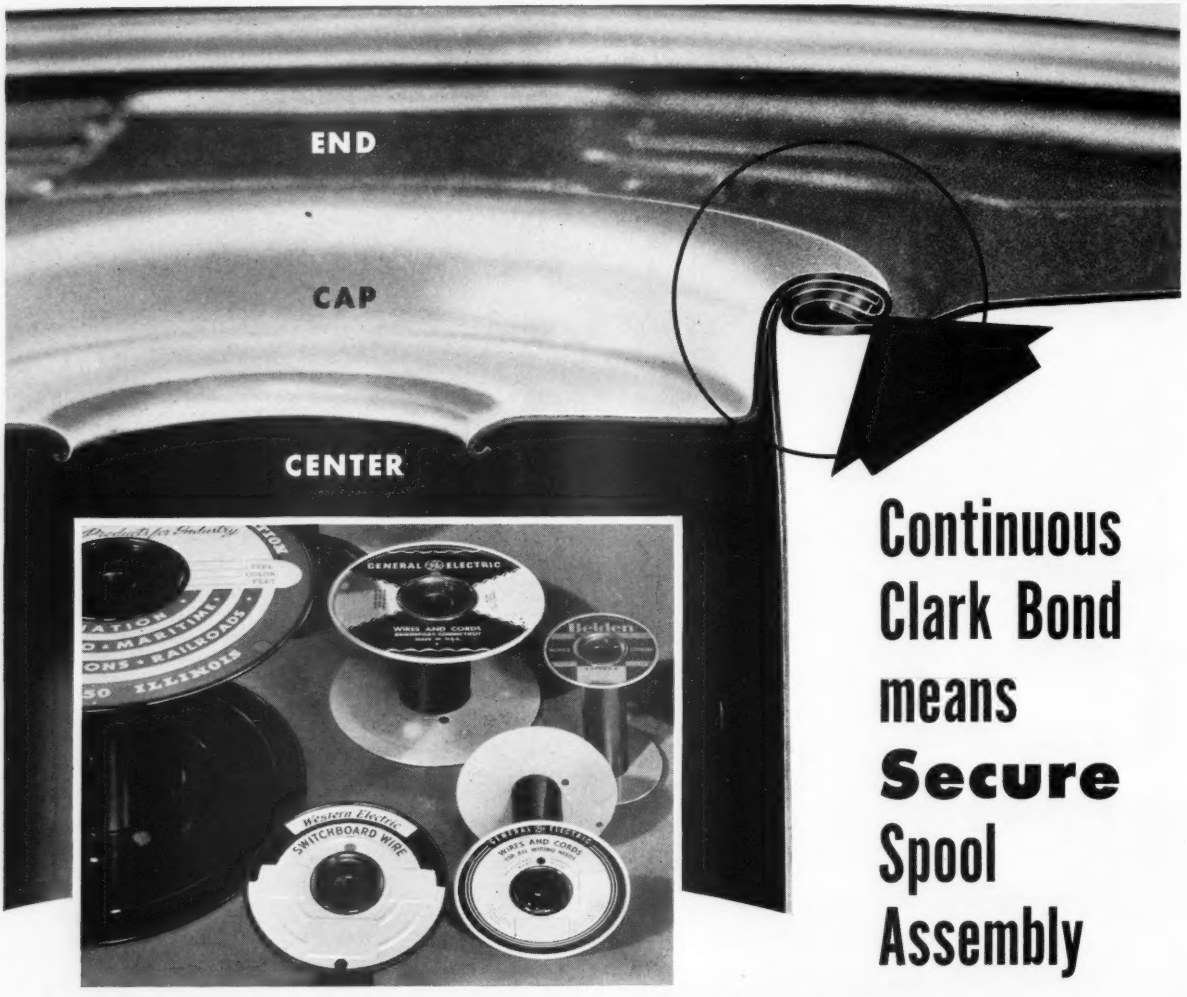
developed by Ilario Properzi of Milan, Italy

for the continuous casting and rolling of aluminum electrical conductor redraw rod is more widely used than any other continuous casting and rolling process in the world.



NICHOLS WIRE & ALUMINUM CO.
Davenport, Iowa, U.S.A.
world agent (Except Europe)

S. P. A. CONTINUUS
Via Cosimo del Fante 10
Milan, Italy



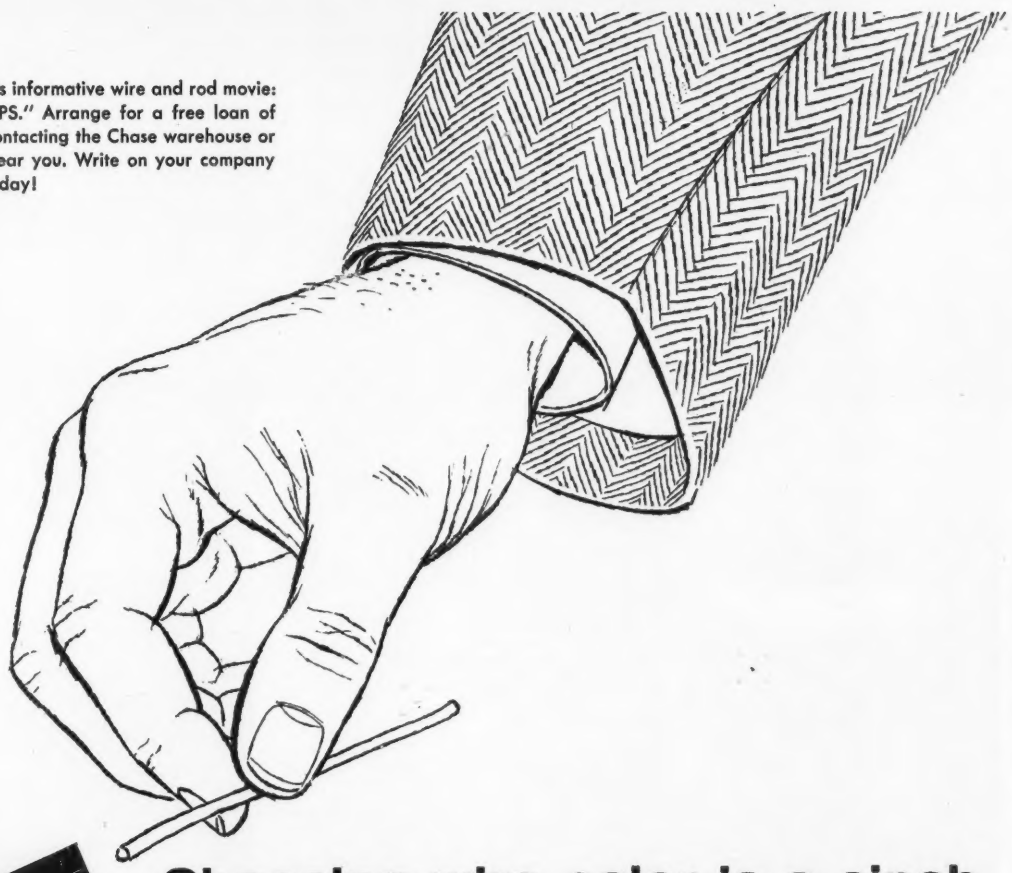
Continuous Clark Bond means **Secure** Spool Assembly

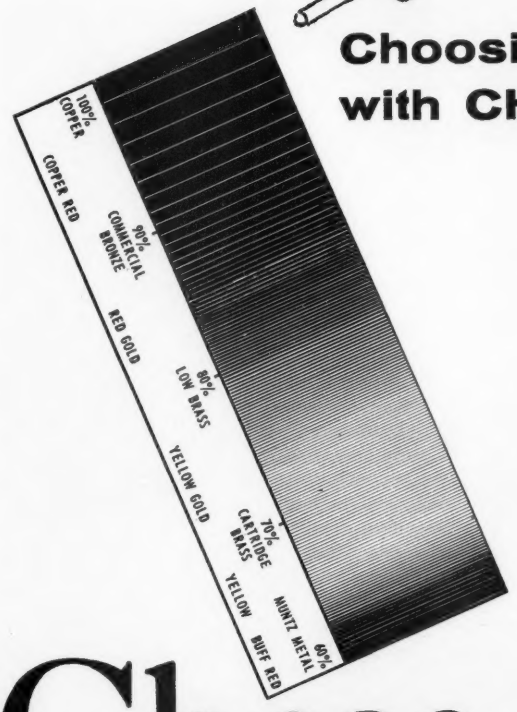
The continuous bond, illustrated above and developed by J. L. Clark, insures secure spool assemblies in a variety of sizes for insulated wire, automotive cable, radio and television wire, and wire solder. This bond between the center and the end of the spool, reinforced by nibs impressed into the cap, positively eliminates independent turning of end, cap, or center. Safety of construction, featuring a full curl at the outer edge of the end and a perfectly smooth surface at the juncture of the center and end, prevents wire from snagging or tearing. A sturdy, *locked seam* provides center rigidity . . . eliminates buckling or bending.

These outstanding J. L. Clark wire spool features are part of a fully integrated service that includes creative design, lithographic decoration, special fabrication, and packaging and shipping. Clark's staff of specially trained artists is available to work with customers in developing and designing colorful spools which enhance product salability and assure instant brand identification. Lithographic decoration combines unusual brilliance and eye appeal with complete product protection. Ask today about our complete spool service. Your inquiry will receive prompt attention from a Clark sales representative, who will gladly send samples and complete information. *J. L. Clark Manufacturing Co., Home Office and Plant, Rockford, Illinois; Liberty Division Plant and Sales, Lancaster, Pennsylvania; New York Sales Office, Chrysler Building, New York 17, New York.*

J. L. CLARK
Lithographed Metal Containers

NEW! Chase's informative wire and rod movie: "IN THE CHIPS." Arrange for a free loan of this film by contacting the Chase warehouse or sales office near you. Write on your company letterhead, today!





Choosing wire color is a cinch with CHASE® on the job for you!

Dramatic changes take place in the color of brass wire, with as little as a 5% increase in zinc content. Most striking are the color shifts that occur as the zinc is increased from 15% to 35%.

That's where a Chase expert can come in mighty handy. He can tell you exactly which copper alloy wire suits your color requirements.

And you can count on every inch of Chase wire he recommends to be uniform in color. Chase's up-to-date annealing equipment makes it possible to consistently produce alloy wire with a high lustre and uniformity of color—plus a surface texture excellent for forming or heading operations.

The Chase warehouse near you can supply this superior wire from warehouse stock or enter your order for direct shipment from Chase mills. Give a call today!

CALL CHASE FOR STAINLESS STEEL TOO!

Chase®

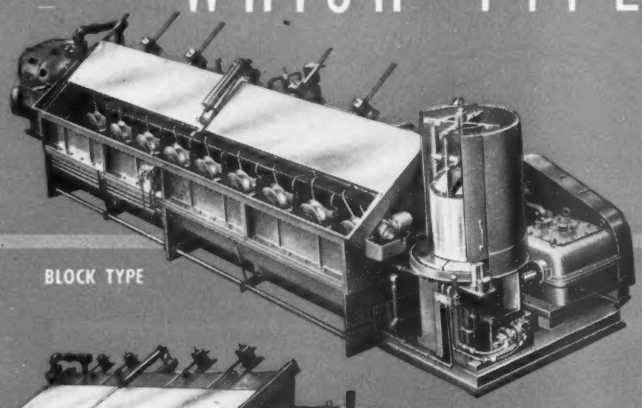
BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

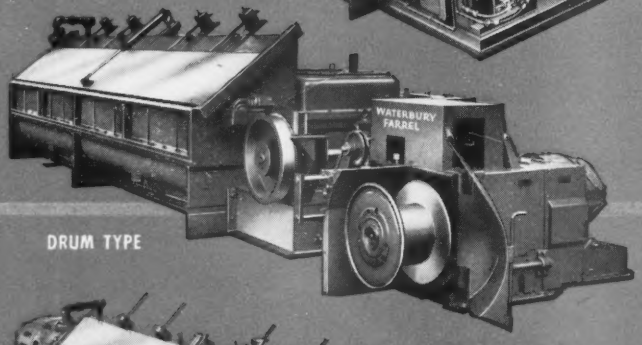
The Nation's Headquarters for Brass & Copper (†sales office only)

Atlanta	Chicago	Denver	Indianapolis	Minneapolis	Philadelphia
Baltimore	Cincinnati	Detroit	Kansas City, Mo.	Newark	Pittsburgh
Boston	Cleveland	Grand Rapids†	Los Angeles	New Orleans	Providence
Charlotte†	Dallas	Houston	Milwaukee	New York	Rochester†
	St. Louis	San Francisco	Seattle	Waterbury	

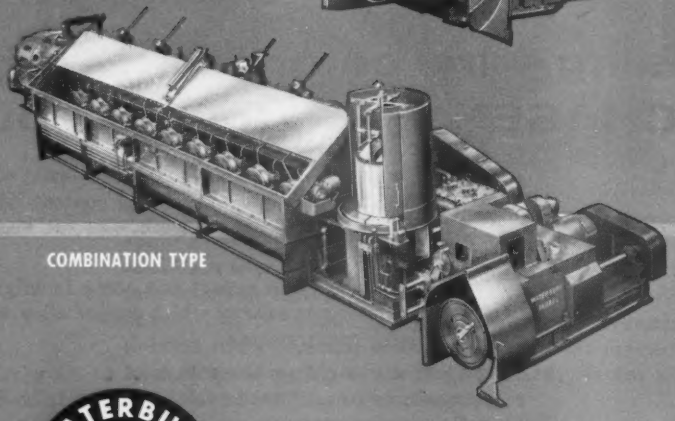
WHICH TYPE



BLOCK TYPE



DRUM TYPE



COMBINATION TYPE

OF WF TANDEM CONTINUOUS WIRE DRAWING MACHINE IS RIGHT FOR YOU?

★ In all three types, Waterbury Farrel *custom-engineers* individual machines to specific requirements for high speed continuous drawing.

★ Each WF machine is backed by over 60 years of experience in designing and building tandem machines.

★ Rugged, precision construction throughout, assures smooth, efficient operation.

WATERBURY FARREL FOUNDRY & MACHINE CO.
Waterbury, Conn. U. S. A.

Branch Offices: Chicago, Cleveland, Millburn, N. J.

WF-27

WATERBURY FARREL FOUNDED 1851

Bolt & Nut Machinery

Power Presses

Rolling Mill Machinery

Wire Mill Equipment

Sendzimir Mills & Special Machinery

SEND FOR YOUR FREE COPY OF THIS NEW 8-PAGE BOOKLET ON WF TANDEM MACHINES.

Covers frames, dies and drawing rolls, driving mechanism, lubrication, packaging and accessory equipment. Gives table of specifications for two sizes. Use coupon or write on letterhead today.

WATERBURY FARREL FOUNDRY & MACHINE CO., WATERBURY, CONN.
Please send me my free copy of your circular No. 786-W-3 on Tandem Wire Drawing Machines.

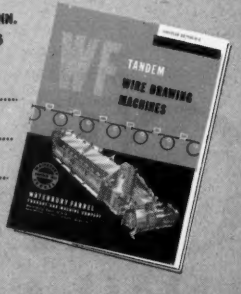
Name.....

Company.....Title.....

Address.....

City.....Zone.....State.....

☐ Please have representative call.



Roebling drum packs are shipped on pallets unless otherwise specified. This gives you today's easiest, least expensive method of moving and stacking wire —with a fork truck, one man can do the work of ten.

Packed to save you money!

IN ADDITION to producing top quality high carbon wire, Roebling has developed many special methods of packing ...and some *one* of these, or some other method which may be developed for your specific requirements, may save a considerable amount of time and money in your plant.

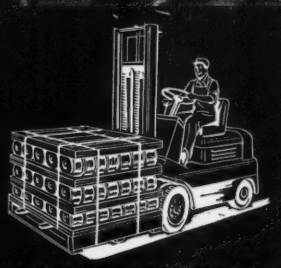
Certain types of wire, for instance, can be packed in hexagonal fibre drum packs that provide superior protection and facilitate handling and storing wire. Drum packs do not have to be returned... save you bother, storage space and freight charges.

You *pay* for the best when you buy high carbon wire. Make sure you *get* the best, in wire and packing too. Always specify Roebling. John A. Roebling's Sons Corporation, Trenton 2, N. J.

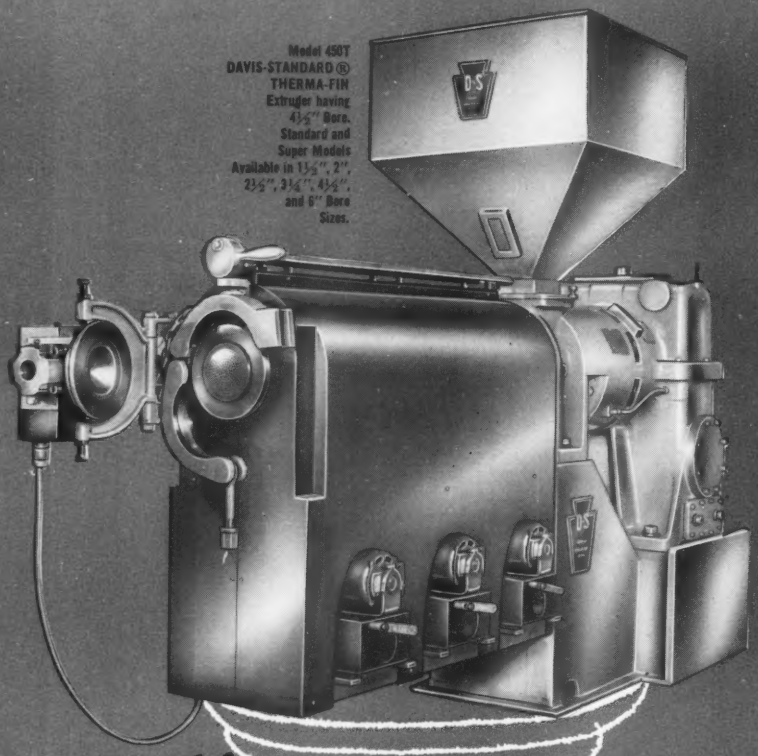
ROEBLING CF&I

Subsidiary of The Colorado Fuel and Iron Corporation

ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. & 5 PITTSBURGH ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 2340 GLENDALE-MILFORD RD., EVENDALE • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • ROCHESTER, 1 FLINT ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • ST. LOUIS, 3001 DELMAR BLVD. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK



If you wish, Roebling spools will be delivered on pallets with separators, providing the easiest and most economical means of handling and stacking wire with fork trucks.



Model 450T DAVIS-STANDARD ® THERMA-FIN Extruder having 4½" Bore. Standard and Super Models Available in 1½", 2", 2½", 3¼", 4½", and 6" Bore Sizes.

We would like to acquaint you . . . with the many unique features that are included in the Davis-Standard® *THERMA-FIN* Extruder. In particular, we wish to describe the exclusive *THERMA-FIN* temperature control system that is the heart of every *THERMA-FIN* Extruder.

Heard about the THERMA-FIN EXTRUDER*?

We certainly hope you have.

But if you haven't, and if you are a manufacturer who extrudes thermoplastics, then we have an extremely important message for you.

However, rather than attempt to give even a condensed description in such limited space, we would welcome the opportunity to give you the complete story that we have prepared in the form of catalog sheets, articles and reprints, etc.

For copies of this literature, write to:

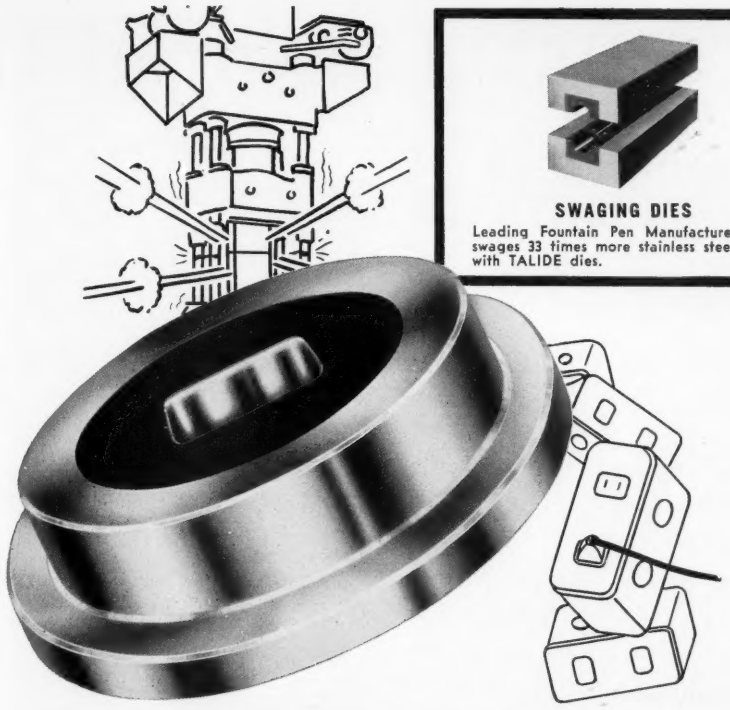
*U.S. Patents Pending

DAVIS-STANDARD SALES CORPORATION

18 WATER STREET, MYSTIC, CONNECTICUT

AGENTS FOR... THE STANDARD MACHINERY CORPORATION
World's Largest Manufacturers of Custom-Built Extruding Machines

IN EUROPE AND THE STERLING AREA, CONTACT FINNEY PRESSES LTD., BIRMINGHAM, ENGLAND



25,680,000 PARTS PRODUCED with ONE TALIDE DIE

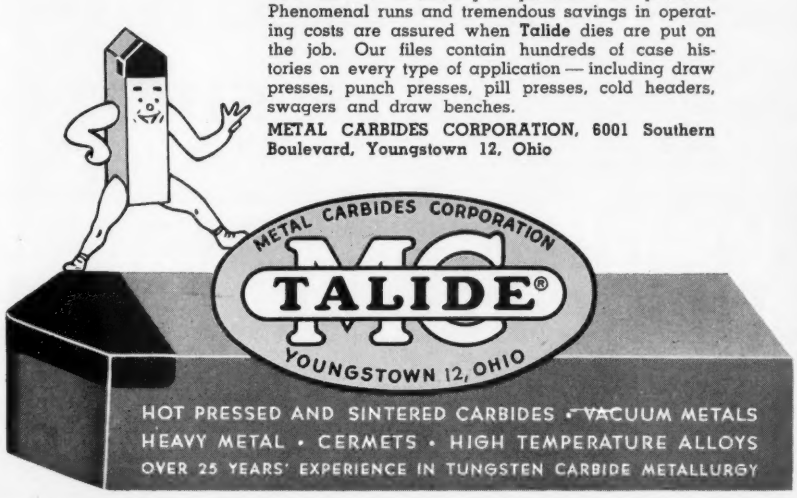
A large electrical equipment manufacturer was having difficulty maintaining production of electrical outlet boxes. Die costs were high, downtime and scrap excessive. It was necessary to remove and repolish the hi-carbon, hi-chrome die every 60,000 pieces. Total production secured from each steel die averaged 700,000 pieces.

After an initial survey, our die engineers designed and installed a **Talide** die using **Grade C-88.** Operation is performed on a 75-ton double action Bliss press. Original die was put in operation 3 years ago and is still going strong, having been removed only once for repolishing — after drawing 15,000,000 pieces!

Total production obtained to date has reached the astounding figure of 25,680,000 outlet boxes — 36 times more production than when using a steel die. The Talide die costs $1,125.00 compared to $500.00 for each steel die. Savings in die cost alone has amounted to over $18,000.00 over the past 3 years, with substantial additional savings realized in increased production. Downtime, repolishing cost and scrap expense were completely eliminated.

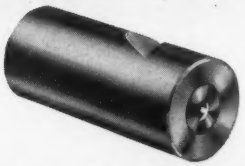
Call in a **Talide** sales engineer for recommendations on how to solve your particular die problem. Phenomenal runs and tremendous savings in operating costs are assured when **Talide** dies are put on the job. Our files contain hundreds of case histories on every type of application — including draw presses, punch presses, pill presses, cold headers, swagers and draw benches.

METAL CARBIDES CORPORATION, 6001 Southern Boulevard, Youngstown 12, Ohio


METAL CARBIDES CORPORATION
MC
TALIDE®
YOUNGSTOWN 12, OHIO
HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • CERMETS • HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

SWAGING DIES

Leading Fountain Pen Manufacturer cold swages 33 times more stainless steel parts with TALIDE dies.

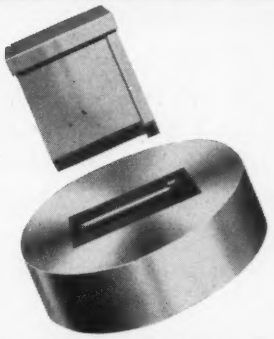


HEADING AND EXTRUSION DIES

Cold-heading 1/4". C-1008 steel rivets, TALIDE dies produced 11,200,000 pieces, other carbide dies only 3,500,000.

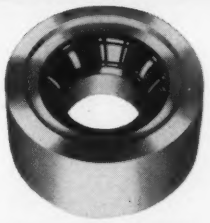
CURLING ROLLERS

TALIDE Curling Rolls last 65 times longer than steel rolls on beverage can forming operation.



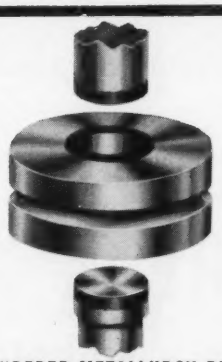
BLANKING AND FORMING DIES

70 times more paper discs blanked out with TALIDE — over hard alloy die.



SHEET METAL DIES

137,000 hi-alloy steel Pressure Vessels drawn with TALIDE, against only 7,900 with steel dies previously used.



POWDERED METALLURGY DIES

Compacting highly abrasive chemical powders, TALIDE Pill dies last 4 months, steel dies wore out in 6 hours.

USED WIRE and CABLE EQUIPMENT

IN STOCK:

- 6 Sinfra Knitting Machines, Model C-3H, 12 x 12 x 14 Needles, Complete.
- 150 16 Carrier Wardwell Braiders.
- 5 24 Carrier Wardwell Braiders.
- 5 Syncro BB-13 13-Die Wire Drawing Machines, 8" Blocks.
- 1 Hartig No. 3 Plastic Extruder, complete with oil supply tank, 30 H.P. motor, drum and control.
- 3 Bench-Type, Electrically heated 1¼" Screw Extruders.
- 1 Royle 6" Rubber Strainer.
- 1 Royle 30" Take-Up Stands.
- 1 Royle 24" Take-Up Stand.
- 1 New Industrial Oven 24" dual Take-Up Stand, completely Hydraulic and Motorized.
- 100 16-Carrier Textile Machine Company No. 2 Braiders, with Mossberg Carriers.
- 50 24-Carrier N.E. Butt Braiders, same as above.
- 30 20-Carrier N.E. Butt Braiders, same as above.
- 1 36-Carrier No. 3 Cable Braiders with 40" Capstan, 6" Horn Gears.
- 20 24-Carrier Textile Machine Co. Heavy-Duty Large-Carrier Cable Braiders, 5½" Horn Gears, 24" capstans.
- 2 Standard Mill Supply Wire Winders.
- 2 12-Wire Take-Up Stands for 22" Reels.
- 1 Syncro 6-Wire Take-Up Stand for 22" Reels.
- 25 Tub-Type Wire Drawing Machines, all sizes and types, from ¼" to #36 Wire.
- 1 New England Butt 5-Wire Strander, for 18 x 10" Reels, Complete.
- 1 New England Butt 7-Wire Strander for 9" x 5" spools, complete with Take-Up.
- All types of Coil Winders.
- 5 Watson Pitch Compound Tanks.

MANY OTHER ITEMS TOO NUMEROUS TO MENTION

WE BUY—WE SELL

We would like to bid on your surplus equipment.

Write or 'phone us today.

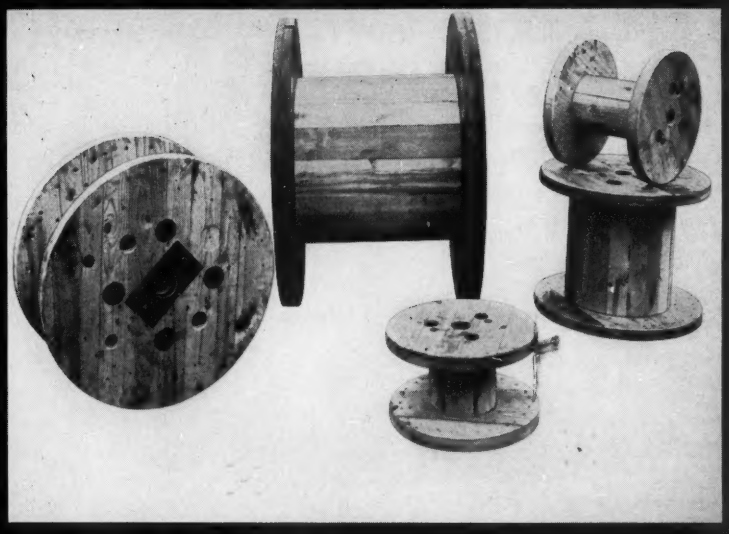
***When You Need Wire Equipment, Why Don't You Try Us* FIRST?**

WIRE & TEXTILE MACHINERY, INC.

80 FOUNTAIN STREET • PAWTUCKET, R. I.

Telephone: PAwtucket 2-7750

use
NON-RETURNABLE
wood
reels
for
all
sizes
and
types
of
electric
wire
and
cable



SHIP the modern way!

LOOK! at the ADVANTAGES

- *REDUCED REEL INVESTMENT*
- *LESS STORAGE SPACE REQ'D.*
- *LOWER FREIGHT COSTS*
- *NO BOOKKEEPING*
- *NO REPAIR COSTS*
- *NO CASH DEPOSITS REQ'D.*
- *NO RETURN FREIGHT COSTS*
- *NO MORE HEADACHES ! ! !*

NON-RETURNABLE REELS GIVE YOU A DEFINITE PACKAGING COST

HIGH SPEED

SHIPPING SERVICE in our . . . OWN TRUCKS

within a radius of 200 miles from the plant. Fast freight will bring you Bridge reels in 5 days or less east of the Mississippi.

BRIDGE
MANUFACTURING COMPANY
HAZARDVILLE, CONNECTICUT

Telephone . . .
Thompsonville, Connecticut
Riverview 9-8308

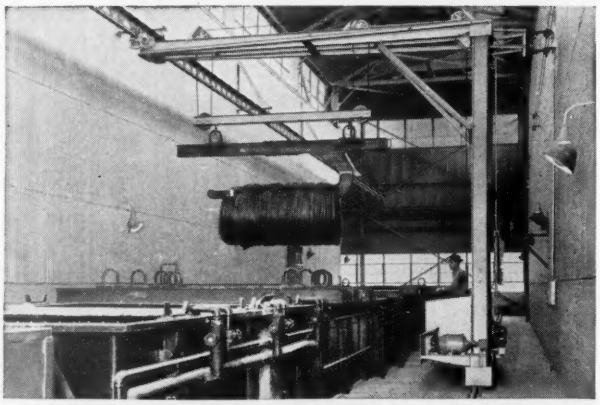
"REEL GOOD . . .

Let us quote on your reel needs. Send your specifications. Better yet, visit our plant and see how and why our reels are made so well at so low a cost.

WOOD REELS"

MATERIALS HANDLING IN THE WIRE INDUSTRY

Many wire and wire products plants are enjoying the numerous advantages possible with Cleveland Tramrail. They are speeding production and lowering costs by using larger production units, eliminating rehandling and reducing machine "shut-down" time. They are using overhead space to save floor space. They are promoting safety. In many instances they are eliminating need of plant expansion by installing Cleveland Tramrail.

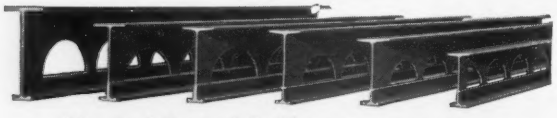


Cleveland Tramrail cleaning house gantry cranes boost production, cut costs sharply and greatly aid health and safety conditions.

STANDARD ITEMS EASILY COMBINED TO HANDLE MATERIALS OF ANY KIND

Cleveland Tramrail raised-tread long-wear rail.

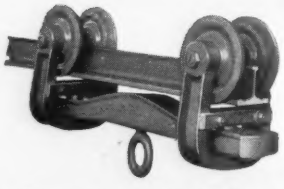
Cleveland Tramrail consists of standard items such as rail, switches, carriers, cranes, hoists, grabs, etc., which can be combined in a thousand-fold ways to serve nearly every materials handling requirement.



Cleveland Tramrail Archbeam in seven sizes for various loads and conditions.

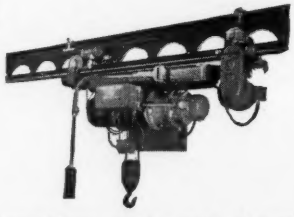
Providing each drawing block with an individual Cleveland Tramrail stripping crane speeds production and brings about sizable savings. Hernia injuries from heavy liftings are eliminated.

30,000 INSTALLATIONS



Hand propelled carrier built for long life and easy operation. Wheels have hardened tread and flange; bearings are double race type.

Backed by experience with 30,000 installations in industries of all types, Cleveland Tramrail representatives are in exceptionally good position to serve you. They will gladly advise, survey your plant, make layout or prepare quotation without obligation.

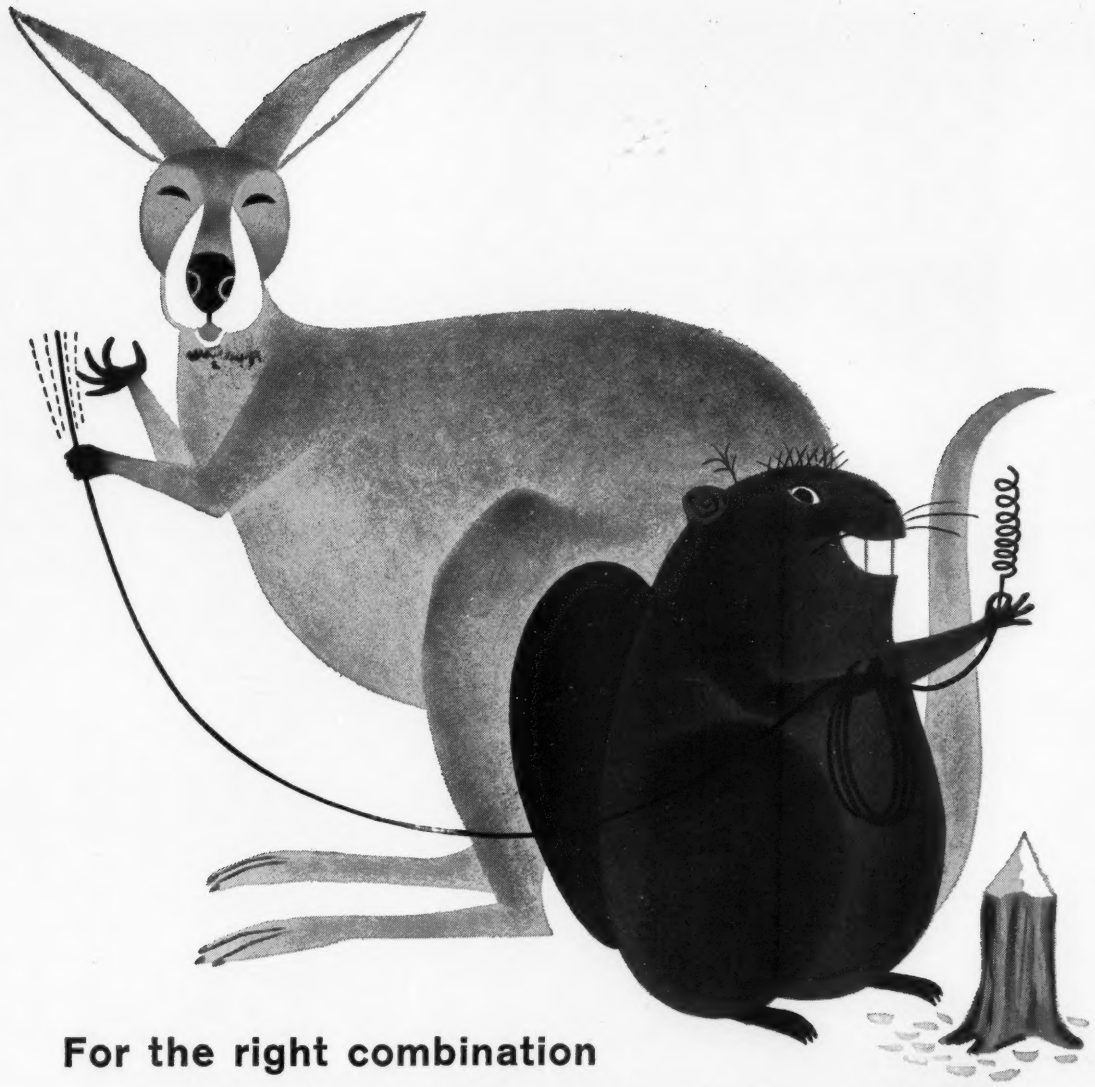


Motor-driven carrier with electric hoist. One of many types built by Cleveland Tramrail.

GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
9205 EAST 288th STREET • WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT



For the right combination of spring characteristics and workability—

specify J&L MASTERCRAFT SPRING WIRE

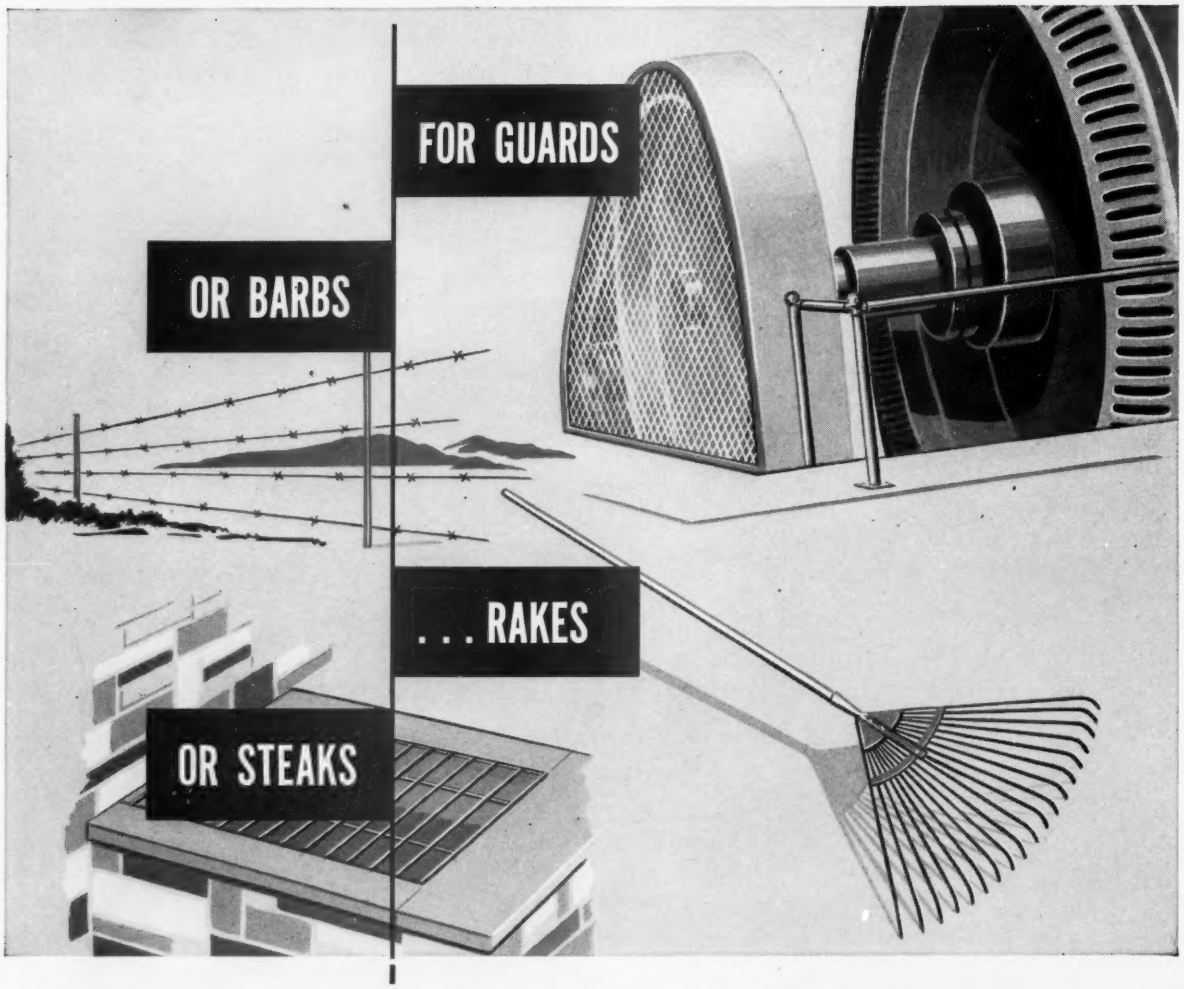
Mastercraft Spring Wire possesses the combination of physical characteristics, size accuracy, and finish which assures efficient forming and springs of the highest quality.

Take advantage of the outstanding uniformity of J&L **Mastercraft Spring Wire,** accomplished through rigid quality control from ore mine to finished product.

Next time you order, specify **Mastercraft Spring Wire.** It's tops in quality—competitive in price.

Jones & Laughlin
STEEL CORPORATION · PITTSBURGH

J&L STEEL



PROMPT COURTEOUS SERVICE on these and other versatile Soaps:

WHITE RIBBON POWDER. White Ribbon Powder in the 41-42° titer range is used by many particular customers as an all-purpose wire drawing compound. Contains 92% anhydrous soap.

FLEXAL W. D. POWDER. Scientifically designed for cold drawing phosphate coated stock.

#559 POWDER. For wet drawing of fine wire products. Will remain fluid and completely free flowing in solution at room temperature.

#5055 WIRE DRAWING COMPOUND. An improved metallic soap for difficult draws on a wide range of high and low carbon steel stock.

Swift
101 ST YEAR

To Serve Your Industry Better

SWIFT'S SOAPS

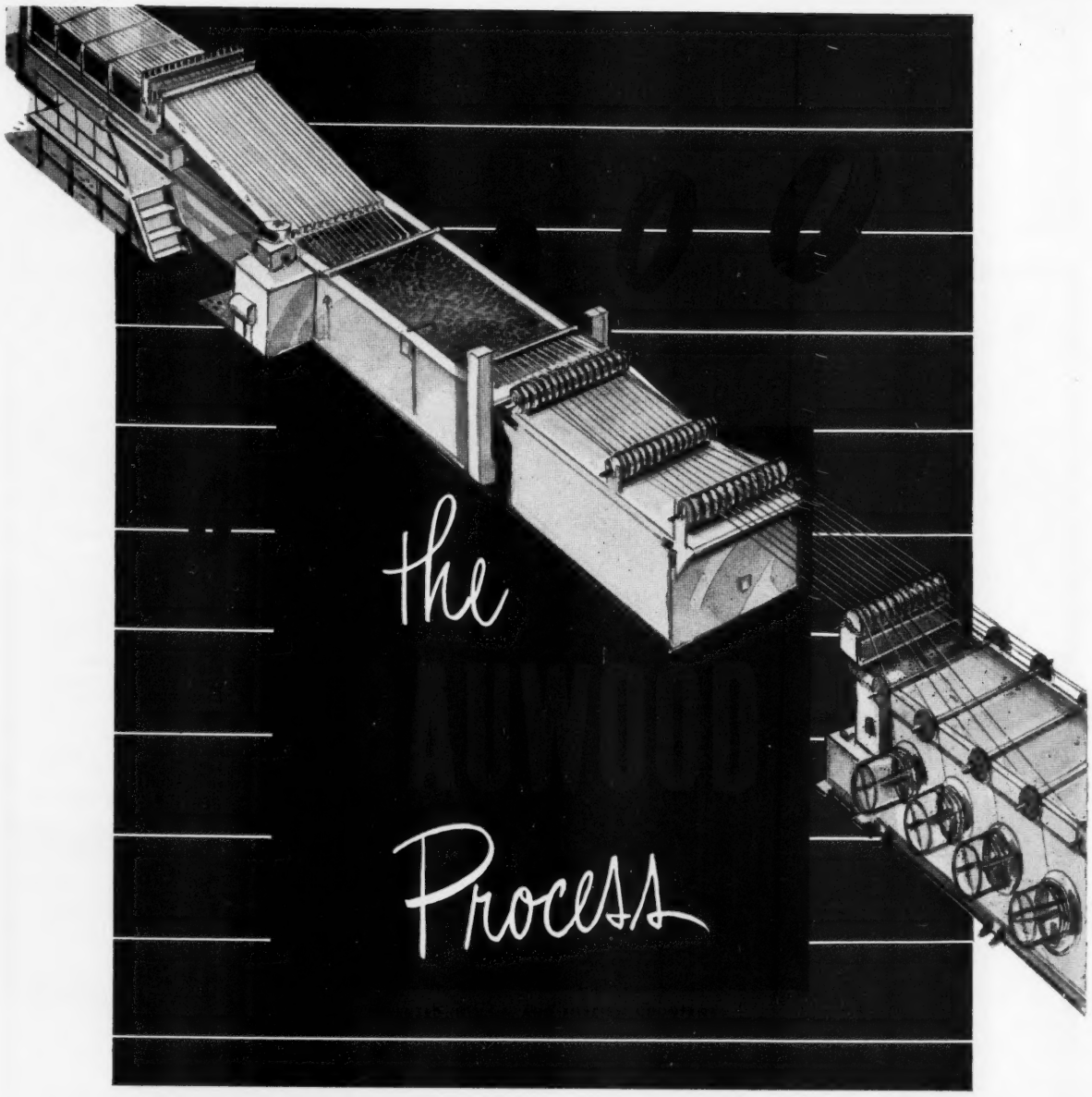
are the efficient lubricant for wire drawing

Wherever the demand for increased production of smoother, brighter wire drawn products exists you'll find Swift's soaps helping to make the *most* of speed and the *least* of heat and stress. A versatile line of efficient, dependable drawing lubricants such as those listed at left are available for immediate delivery from strategically located Swift & Company distribution points throughout the U.S. and Canada. With them, you need never compromise the efficiency you have invested in high-speed drawing equipment.

Write for details on a trial order today . . . see for *yourself* how a truly efficient drawing soap can help extend die life *and* help increase production. Remember too that—

ONE TRIAL IS BETTER THAN A THOUSAND CLAIMS

SWIFT & COMPANY, Soap Department, Chicago 9, Illinois



● The TRAUWOOD PROCESS is a new patented principle of wire heating, applied to the continuous strand patenting, oil tempering, and annealing of round and flat carbon and alloy steel wire and strip. Progressive manufacturers demand the most efficient, scientific, and up to date heat treating equipment available. Today's applications for wire and strip require the use of material having the highest possible physical and fatigue properties. Many manufacturers are installing Trauwood equipment to replace equipment of ordinary design. For superior quality, greater production, and economy of operation, you cannot specify a better heat treating practice than that which the TRAUWOOD PROCESS affords.

Send us your inquiries and for illustrated brochure

TRAUWOOD WIRE AND STRIP HEAT TREATING EQUIPMENT IS ENGINEERED AND BUILT TO YOUR SPECIFIC REQUIREMENTS

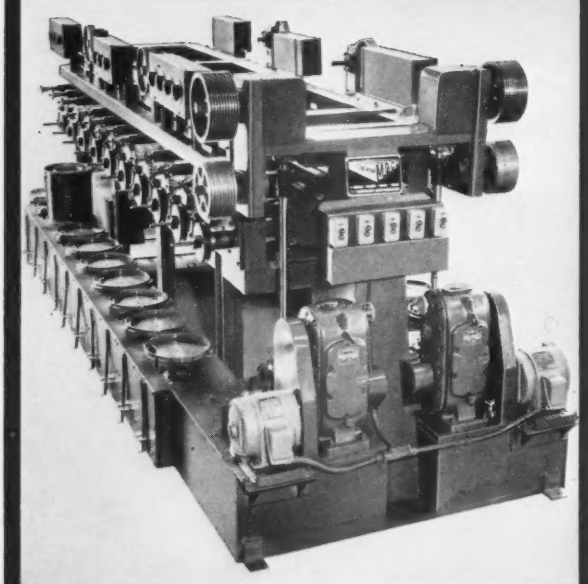
THE TRAUWOOD ENGINEERING COMPANY

P. O. BOX 2719, WEST PARK STATION • 15320 BROOKPARK ROAD

CLEVELAND 11, OHIO

Representatives in principal cities and foreign countries on request

NEW

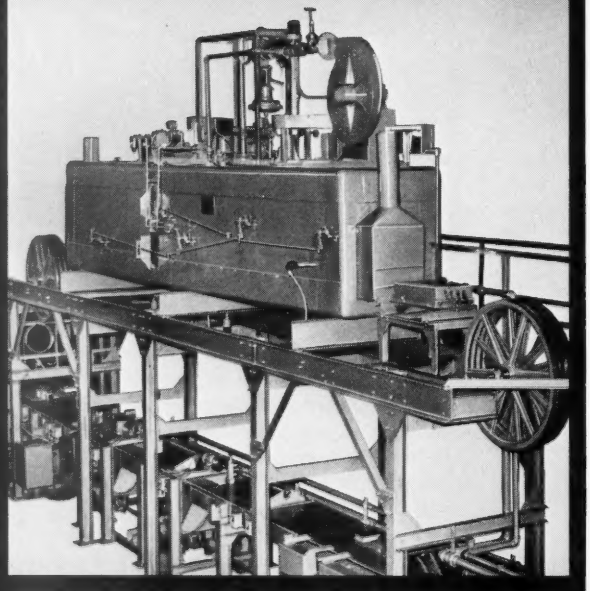


New Reel-R-Drum Packer handles two wire sizes simultaneously at different speeds through the same process.

MOCO's new Reel-R-Drum Packer is setting production records in forward-looking companies. This versatile unit has a speed range from 20 to 120 feet per minute. You can produce two wire sizes simultaneously through the same process at different speeds. Handling wire sizes ranging from .0089" to .025" in diameter, this MOCO Reel-R-Drum packages annealed copper magnet wire on different reels or in nominal 100 lb. capacity Payoffpak Drums, or both simultaneously. This versatile unit is built for tandem operation with a high speed MOCO type "C" wire enameling machine.

New MOCO Machine bakes on 4 coats of insulating varnish and two servings of glass or yarn at 100 F.P.M.

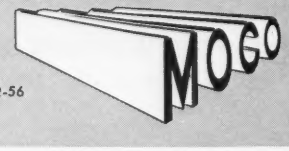
Satisfied users acclaim this new insulating, impregnating and varnish baking machine as a completely revolutionary development in the field of wire enameling. It is capable of turning out over a mile-per-hour of heavy rounds and rectangulars (up to 150 M. Sq. Mls. Cross Sectional Area), baking on 4 coats of insulating varnish and applying two servings of glass or textile yarns . . . simultaneously! MOCO's revolutionary Rapid-Cool Oven lets you stop production without damage to wire in the oven. Return to full production in a matter of seconds because of the rapid rise of the temperature inside this MOCO Tunnel Oven.



FOR MORE INFORMATION

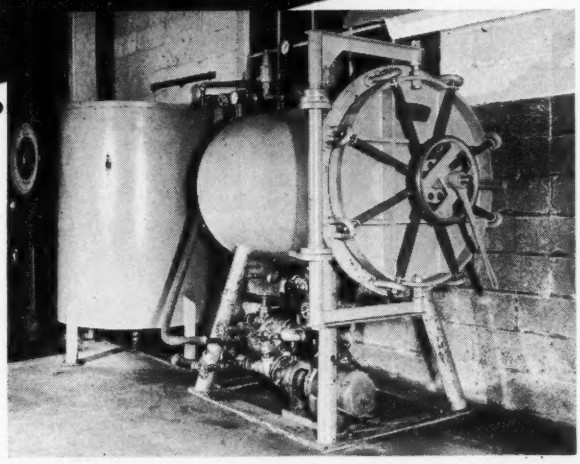
MICHIGAN OVEN COMPANY

421 BRAINARD • DETROIT 1, MICHIGAN



W2-56

FILTER MINERAL OIL
for die lubrication
AND
Make These Savings



Hercules Filter installation in prominent wire drawing plant.

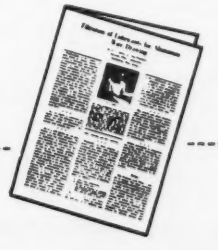
The use of filtered mineral oil in place of soluble oil is saving many wire drawing firms thousands of dollars a year.

The soluble oils formerly used caused a build-up of fats in the equipment, clogging of jets, formation of rust, and frequent interruptions of production for cleaning purposes.

These disadvantages are eliminated when you use filtered mineral oils.

- Substantial dollar savings are effected.
- The oil does not have to be changed.
- The body of filtered oil remains in the same condition as when new—not for months but for several years. Only slight additions are needed.
- Die life is increased 50% or more. In one plant 21,000 pounds of .064 - .013 wire was drawn when Hercules filtered mineral oil was used as against 6,000 pounds of similar wire with unfiltered oil. Wire can be drawn at higher speed—i.e. up to 4500 to 5000 ft./min. for aluminum.
- Also, it is possible to substitute up to 50% of carbide dies in place of diamond dies.
- Use of filtered oil eliminates possibility of clogged oil passages which frequently cause burned dies.

SEND COUPON BELOW for Paper delivered before the Wire Association in New York City on April 29, 1955, which gives complete data on the economy and effects of using filtered mineral oil for the lubrication of wire drawing machines.



HERCULES FILTER CORPORATION
191 Ethyl Ave.
Hawthorne, N. J.

Send me copy of report with data regarding savings effected through the use of Hercules filtered mineral oil in wire drawing.

Name .....

Company .....

Street .....

City ..... Zone ..... State .....

HERCULES FILTER
CORPORATION
191 Ethyl Avenue
Hawthorne, New Jersey

TINSELS

ALL TYPES AND SIZES

BARE ELECTRIC TINSEL CONDUCTORS

Used in cords for: Telephones—Radios—Electric Shavers —Hearing Aids. Used bare for voice coil lead wires on loud speakers.

SILVER COATED COPPER WIRE

For Stranded Cables. ASTM Designation B 298-55T

TINSEL LAME (FLAT WIRE)

Silver and False Gold Coated Copper—Aluminum Slit-foil for Tinsel Ribbons and Garlands.

KNITTED MESH AND CURLED WIRE— FLAT AND ROUND

For Vibration & Shock Absorbing Cushions
For Electronic Shield
For Filters & Mist Eliminators

YARNS—TARNISH PROOF GOLD AND SILVER

"NEVA-TARN" Yarns — Buturate and Mylar* Film — Plain, Supported or in Novelty Yarns for Knitters and Weavers of Dress, Upholstery, Automobile and Drapery Fabrics.

* DuPont's Trademark.

Write or telephone to Tinsel Headquarters for quotations on your tinsel requirements.

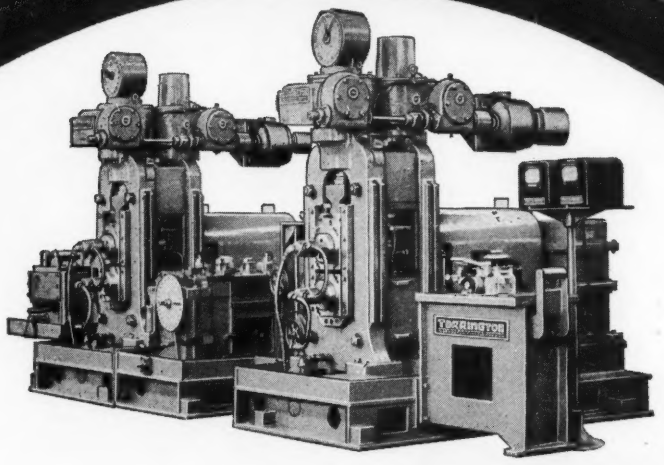
THE MONTGOMERY COMPANY

ESTABLISHED IN 1871

25 CANAL STREET • WINDSOR LOCKS, CONN.

Telephone: Windsor Locks NATIONAL 3-3338

YOU CAN LOWER WIRE ROLLING COSTS



...with a Torrington Flat Wire Mill

SPEEDED PRODUCTION — Torrington Flat Wire Mills achieve finishing speeds up to 3500 FPM.

GREATER ACCURACY — Processed wire can be held to tolerances of .00025″ in thickness and .0005″ in width. Automatic magnetic gauges eliminate waste.

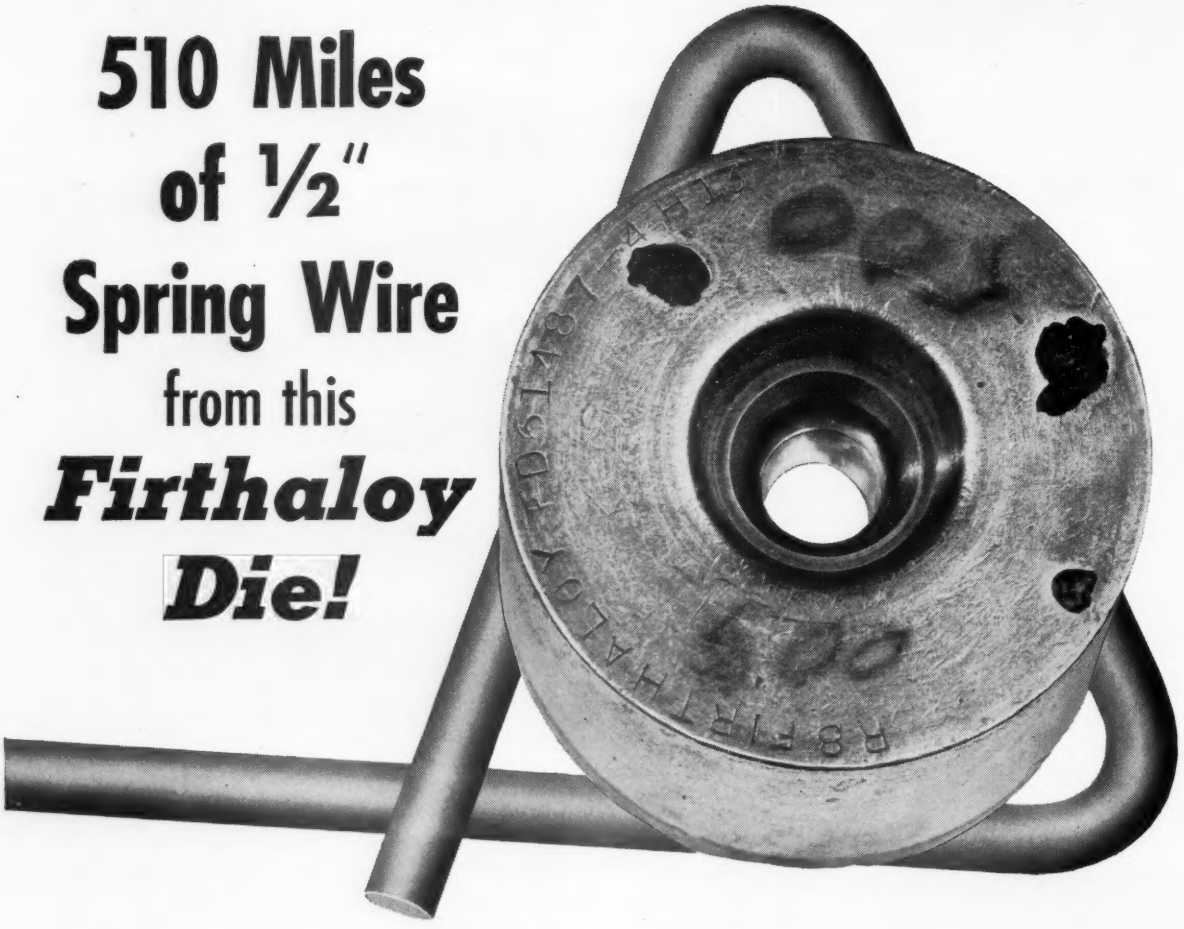
FLEXIBILITY — Combination of two or three flattening stands, with edgers, can accommodate wide variety of work.

DEPENDABILITY — Torrington machines are ruggedly built for years of repair-free service. Easy access to flattening rolls and other major components greatly reduces downtime for maintenance, adjustment and threading.

COMPLETE ENGINEERING SERVICE — Auxiliary mill machinery should be selected only after thorough consultation with experienced engineers. Torrington's engineering staff, backed by the knowledge and skill gained while serving the metal mills for nearly 70 years, will work with you to provide machinery best fitted to your needs. For full information, call or write: Mill Machinery Division, Torrington Manufacturing Company, Torrington, Conn.

THE
TORRINGTON
MANUFACTURING COMPANY
TORRINGTON, CONNECTICUT
VAN NUYS, CALIFORNIA · OAKVILLE, ONTARIO

510 Miles of ½" Spring Wire from this *Firthaloy Die!*



The unretouched photo of the Firthaloy draw die above may not be very pretty—but what die would be after drawing 1,800,000 lbs. of ½" high carbon spring wire! The important fact is, that despite the appearance of the steel casing, the Firthaloy carbide nib (standard grade H-13) had worn *only 1/1000 of an inch when it was retired after 6 years of continuous service!*

The leading New England manufacturer who returned the die to us for our "museum" thinks his 1948 purchase was a good one.

You, too, can get comparable results when you specify *Firthaloy* for your own die shop or from your tool and die maker . . . in round, square, hex and all special shapes.

Write for information or literature today

VISIT OUR SUITE AT THE PENN-SHERATON DURING THE CONVENTION SUITE 566-68-70.

Mr. Tooley says—

"Firth Sterling offers wire manufacturers and fabricators the advantages of a *single* source of supply for both tungsten carbide dies and high grade die steels. This *complete* line, from famous Firthaloy carbide through almost one hundred grades of high speed and tool steels saves you time and money."

Firth Sterling

—INC—

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

MILLS: McKEESPORT, TRAFFORD, DETROIT, HOUSTON

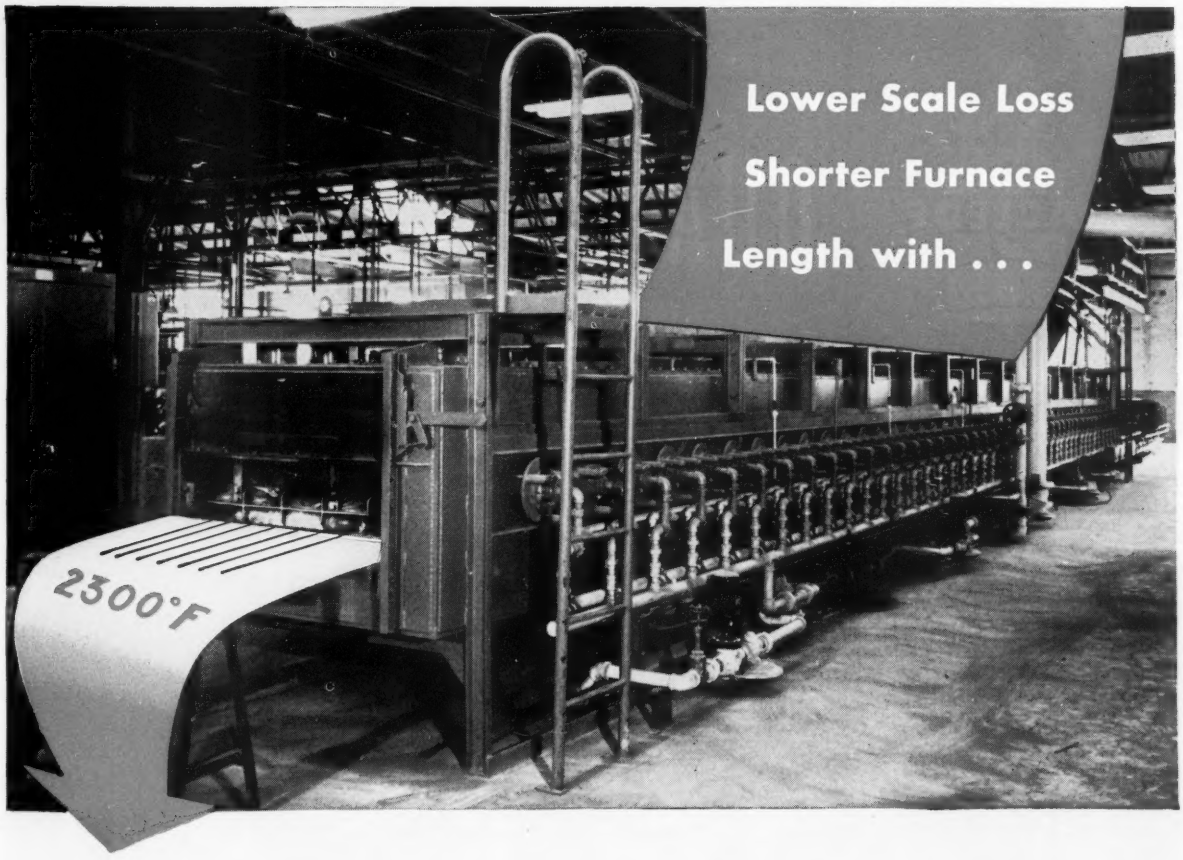
OFFICES AND WAREHOUSES*: BIRMINGHAM CHICAGO* CLEVELAND DAYTON DETROIT* HARTFORD* HOUSTON LOS ANGELES* NEW YORK PHILADELPHIA PITTSBURGH WASHINGTON WESTFIELD, N.J.

R-312

PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets
Zirconium

FIRTH STERLING TRADE MARK



GASMACO wire patenting furnaces

GASMACO Wire Patenting Furnaces substantially reduce maintenance and operating costs and keep production at a steady pace. Elevated furnace temperatures heat faster; permit shorter furnace design and thus offer floor space bonuses.

Necessity of alloy muffle tubes eliminated. Indirect-fired GASMACO Patented Silicon Carbide Radiant Tubes virtually eliminate "down time," and supply high thermal head with atmosphere control over scale.

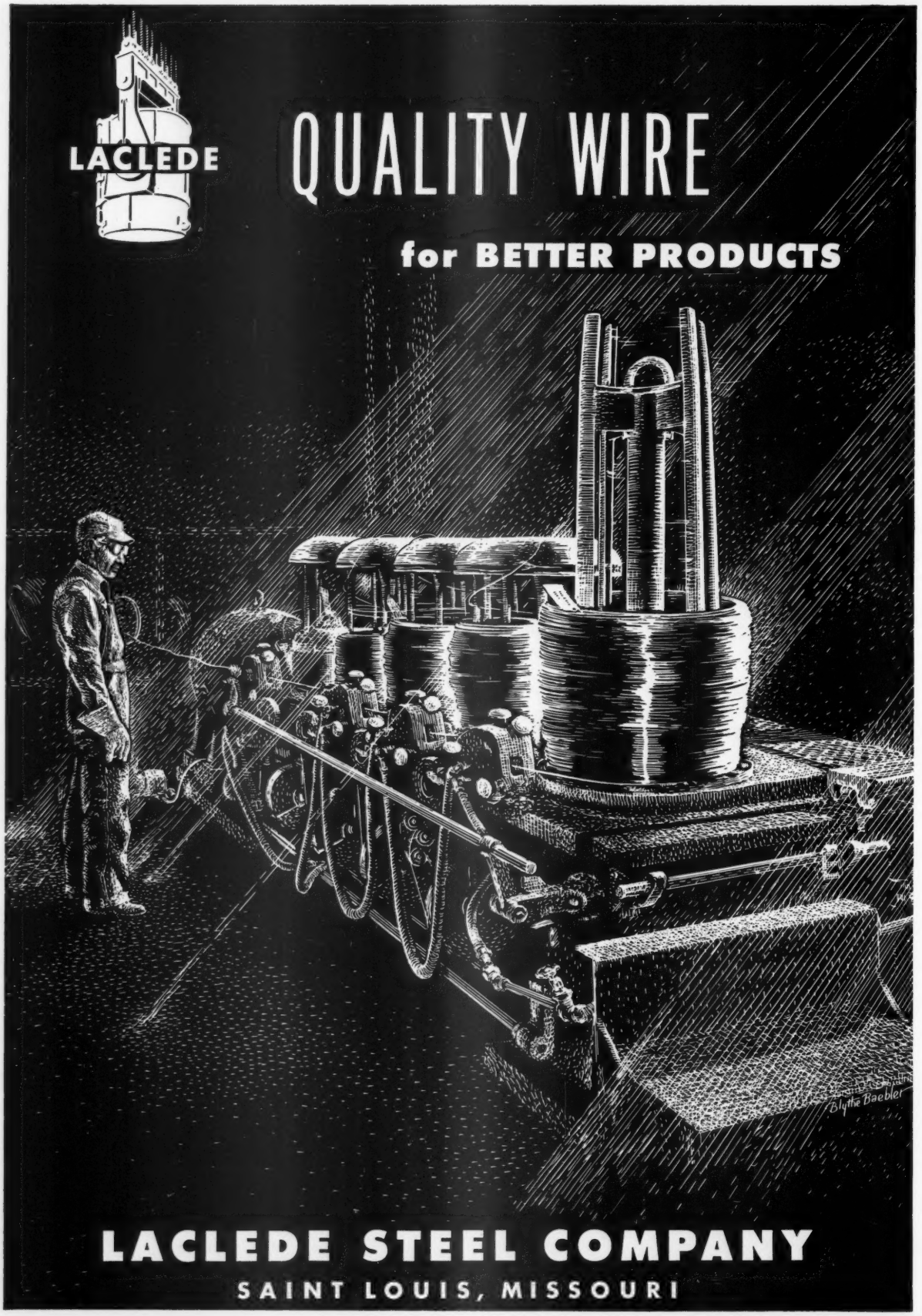
For a complete description of a GASMACO Wire Patenting Furnace at work, write for your copy of Bulletin A-106.

REPRESENTATIVES IN:

BIRMINGHAM • BOSTON • CHICAGO • ST. LOUIS • LOS ANGELES • SEATTLE • SAN FRANCISCO

THE GAS MACHINERY COMPANY
16110 WATERLOO ROAD
CLEVELAND 10, OHIO

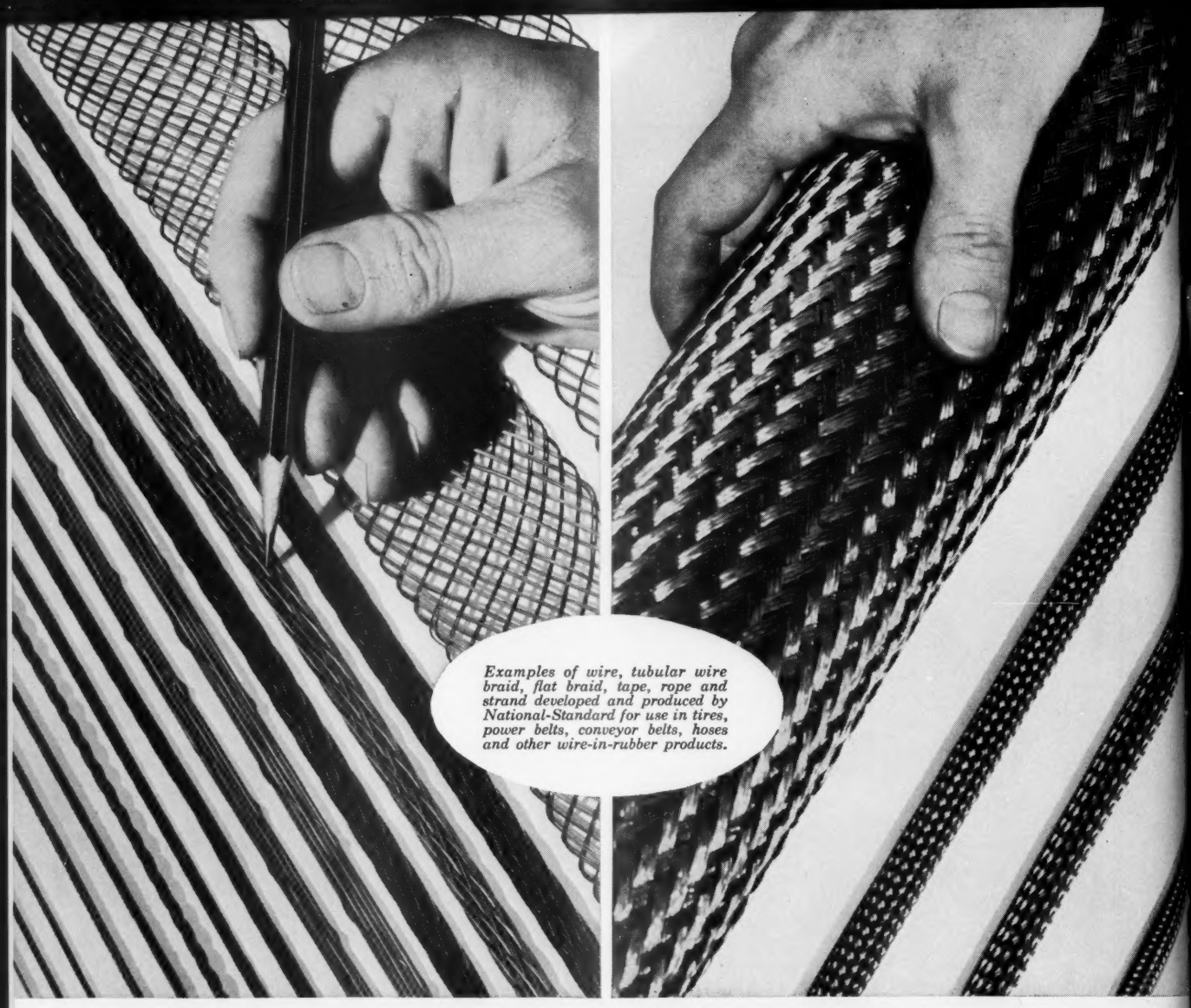
Designers • Fabricators • Erectors
Gas Plant Equipment and Industrial Furnaces
THE GAS MACHINERY CO. (Canada) Ltd.
HAMILTON, ONTARIO


LACLEDE
QUALITY WIRE
for BETTER PRODUCTS
Blythe Baebler
LACLEDE STEEL COMPANY
SAINT LOUIS, MISSOURI

PHONE 2-3043

HOWSAM SPOOL COMPANY

500 RATHBONE AVE. AURORA ILLINOIS



Examples of wire, tubular wire braid, flat braid, tape, rope and strand developed and produced by National-Standard for use in tires, power belts, conveyor belts, hoses and other wire-in-rubber products.

How product "X" might be improved

• Whatever you make, from cheese slicers to electronic brains, chances are wire of some kind in some form enters into your product make-up. Maybe it isn't special wire. Maybe it should be! In either case it is in this area that National-Standard service might help you produce a better product at lower cost.

For example, National-Standard has long devoted large scale research and engineering to improving the teamwork of wire and rubber—extensive work on wire fabrication, material, finish, corrosion, strength, elongation, adhesion and other factors that affect the behavior and cost of wire-in-rubber products.

You can draw on the fruits of all this and similar work performed for many other industries on the most effective use of wire.

So if you even suspect that a different or specially developed type of wire might improve your product or speed production, don't hesitate. Consult with National-Standard. We make a point of such service . . . want to be of help . . . and are geared to do it well, without obligation. Check with us now . . . or any time!

NATIONAL-STANDARD COMPANY • NILES, MICHIGAN
Tire Wire, Stainless, Fabricated Braids and Tape

ATHENIA STEEL DIVISION • CLIFTON, N. J.
Flat, High Carbon, Cold Rolled Spring Steel

REYNOLDS WIRE DIVISION • DIXON, ILLINOIS
Industrial Wire Cloth

NS
NATIONAL-STANDARD
Company
NILES, MICHIGAN

WAGNER LITHO MACHINERY • JERSEY CITY, N. J.
Special Machinery for Metal Decorating

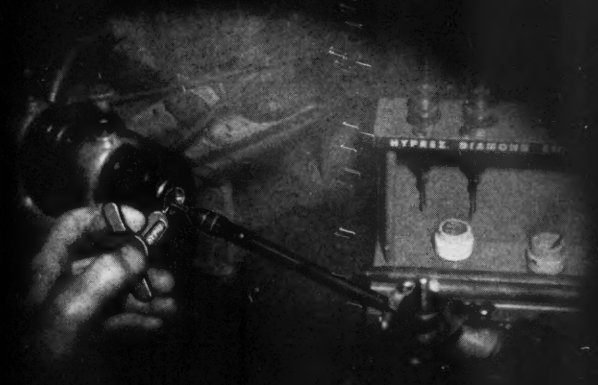
WORCESTER WIRE WORKS DIVISION • WORCESTER, MASS.
Round and Shaped Steel Wire, Small Sizes

for longer die life SUPERIOR TUBE COMPANY finishes with HYPREZ

HYPREZ
DIAMOND COMPOUNDS
for flawless lapping and polishing

In the Norristown, Pa., plant of Superior Tube Company, many hundreds of high-precision drawing dies must be finished and constantly maintained for maximum production.

Superior has found that long die life and top performance result from the use of Hyprez. These compounds comprise diamond particles of exact grading and concentration in a vehicle that assures permanent suspension and maximum finishing action. Hyprez Diamond Compounds are available in a complete range of grades from coarsest to finest.



From roughing to polishing, Hyprez Diamond Compounds produce finer finishes faster.

Di-Profiler
RECIPROCATING HAND MACHINE
saves time on detail and irregular surfaces

At Superior Tube Company, as well as in die, mold and tool shops throughout the country, the Di-Profiler has demonstrated important cost reductions in cutting, lapping and polishing operations on regular or irregular dies. This machine saves tedious hours of manual labor, especially on curved or fine detail jobs.

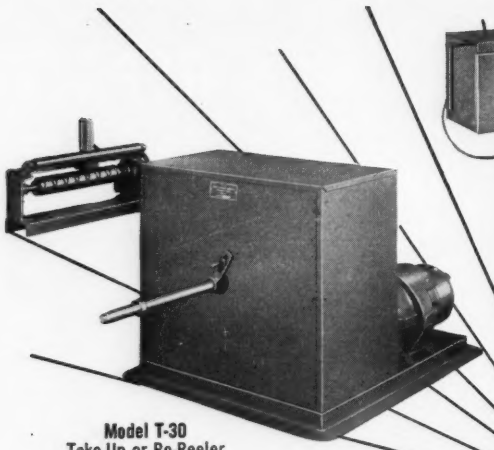
A variable stroke of 0 to 6 mm. (¼"), at a controllable speed of 0 to 100 per second—together with a complete assortment of cutters, files, discs, points, burrs, and scrapers—offer a versatility that makes the Di-Profiler economical for every type of precision job.

To finish any contour or detail, the Di-Profiler saves hours of expensive hand labor.

Ask for free demonstration or Technical Bulletin No. W106

ENGIS EQUIPMENT COMPANY

431 SOUTH DEARBORN ST. • CHICAGO 5, ILL.

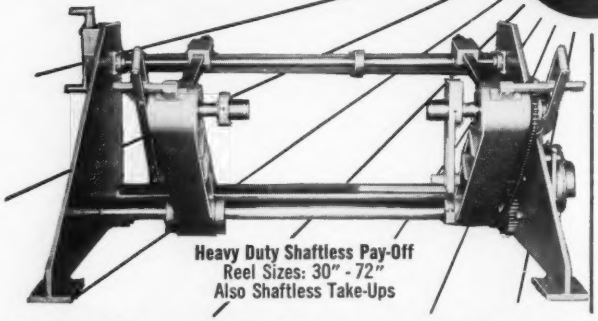


Model T-30
Take-Up or Re-Reeler

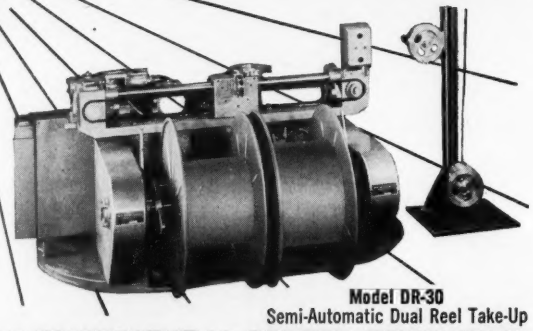
No. 4 Spark Tester
Automatic Resparking for Re-Reeling

CV Type Sparker
For Continuous Vulcanizing
or Plastic Extruding

FOR ACCURACY DAVIS WIRE & CABLE EQUIPMENT FOR DEPENDABILITY



Heavy Duty Shaftless Pay-Off
Reel Sizes: 30" - 72"
Also Shaftless Take-Ups



Model DR-30
Semi-Automatic Dual Reel Take-Up

THE NEWLY REDESIGNED *DAVIS WIRE & CABLE EQUIPMENT* IS BETTER THAN EVER

Modernized, streamlined and engineered for fast production of safely insulated wire and cable, the newly redesigned DAVIS ELECTRIC line of Spark Testers, Pay-Offs, Take-Ups, Counters, Spoolers, Traverses and Capstans is now offered as the finest ever conceived and produced by DAVIS ELECTRIC engineers. Before you buy, you owe it to your pocketbook as well as your business reputation to learn what this unexcelled machinery can do to better satisfy your customers (and your stockholders!). Refinements and advancement in designs qualify the 1955 DAVIS ELECTRIC line to surpass in performance previous DAVIS products in use in 80% of the industry's wire mills and some of which have been in operation for 15 years without maintenance problems!

What better tribute to quality can one ask?

Write for complete details and find out how DAVIS ELECTRIC can improve your wire and cable production and promote profit in your plant.

Davis ELECTRIC CO.

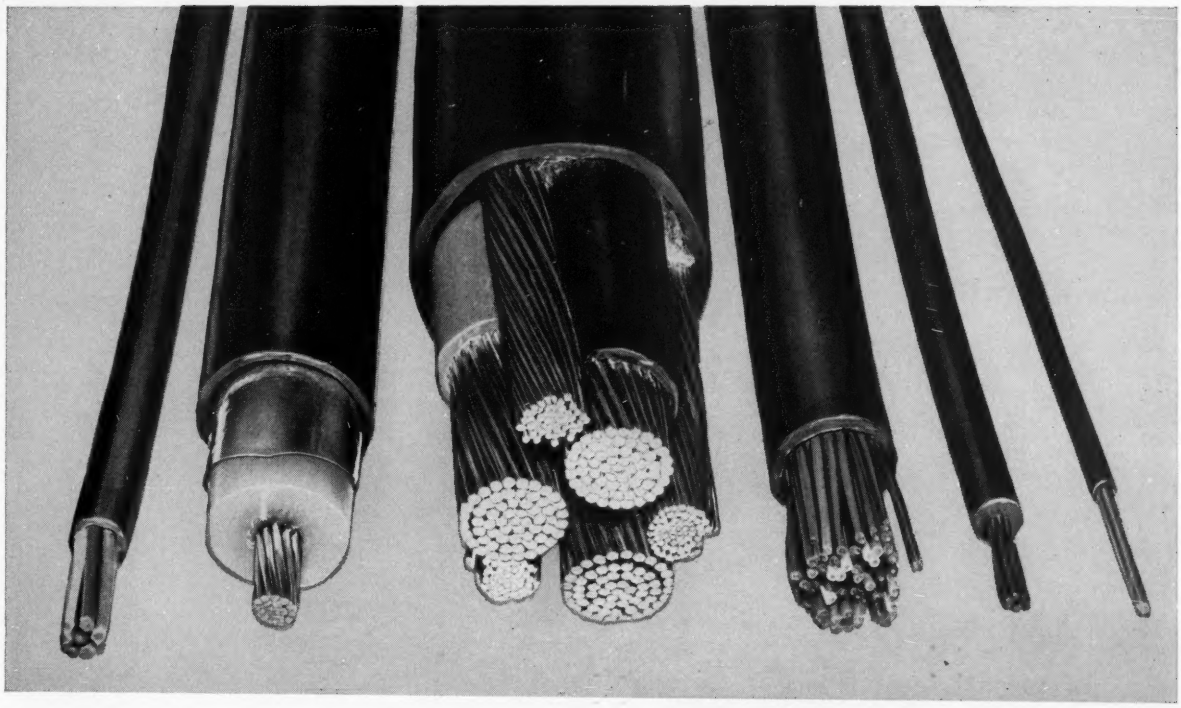
WALLINGFORD, CONN., U.S.A.

DAVIS WIRE & CABLE EQUIPMENT

HARNESS TESTERS ★ PAY-OFFS ★ TRAVERSES
SPARK TESTERS ★ SPOOLERS ★ TAKE-UPS ★ CAPSTANS

Correspondents throughout the world

Foreign Sales Representatives: OMNI PRODUCTS CORP. 460—4th Avenue, New York 16, New York



There is an ALATHON® polyethylene resin for your specific insulating and jacketing need

ALATHON polyethylene resins are outstanding in the field of electrical insulating and jacketing materials. Not only are the inherent properties of ALATHON suited for wire and cable insulation, but a number of compositions have been developed for specific applications. Performance in these specific uses has been improved by basic changes in the molecular structure and by advances in compounding with improved stabilizers and other ingredients.

ALATHON polyethylene resins offer low power loss and dielectric constant, toughness and flexibility even at extremely low temperatures, and high moisture resistance. ALATHON has particularly outstanding thermal and mechanical properties.

ALATHON 4, BK-20 (black) offers exceptional outdoor durability and resistance to environmental stress cracking. It is protected from ultraviolet light by fine channel black, intimately dispersed, and has excellent low-temperature toughness, contributed by the high molecular weight of the composition.

ALATHON 5, NC-10 (natural) and ALATHON 5B, NC-10 (colorless) are unpigmented and offer the best electrical properties. The low power factor and dielectric constant of these resins remain essentially unchanged over the entire range of frequencies measured to date, and over a wide range of temperatures.

ALATHON 5, BN-07 (brown) is specially compounded to give a measure of weather resistance without sacrificing low dielectric loss characteristics.

ALATHON 5, BK-21 (black) is protected from ultraviolet light by fine channel black. It has good loss characteristics for material containing carbon.

ALATHON 5, BK-22 (black) is similar to ALATHON 5, BK-21, but contains more carbon black for greater weather resistance.

ALATHON 6, NC-10 is a foamable polyethylene composition that forms a cellular wire coating with fine, discrete pores. Because of the presence of the inert gas, the dielectric constant is even lower than that of solid polyethylene.

RULAN is based on polyethylene resin compounded to give flame-retardant qualities with good electrical properties. RULAN passes the Underwriter Laboratories vertical flame test.

Du Pont has prepared property and application data that will help you choose the composition of ALATHON which will work best in your specific application. To get this complete information, simply clip and mail coupon.

There is a difference in polyethylenes—

specify **ALATHON®**
polyethylene resin

DU PONT
REG. U. S. PAT. OFF

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room 7010, Du Pont Building, Wilmington 98, Delaware

In Canada: Du Pont Company of Canada Limited, P. O. Box 660, Montreal, Quebec.

Please send me complete information on Du Pont ALATHON polyethylene resins. I am interested in evaluating these materials for

_____

Name_____

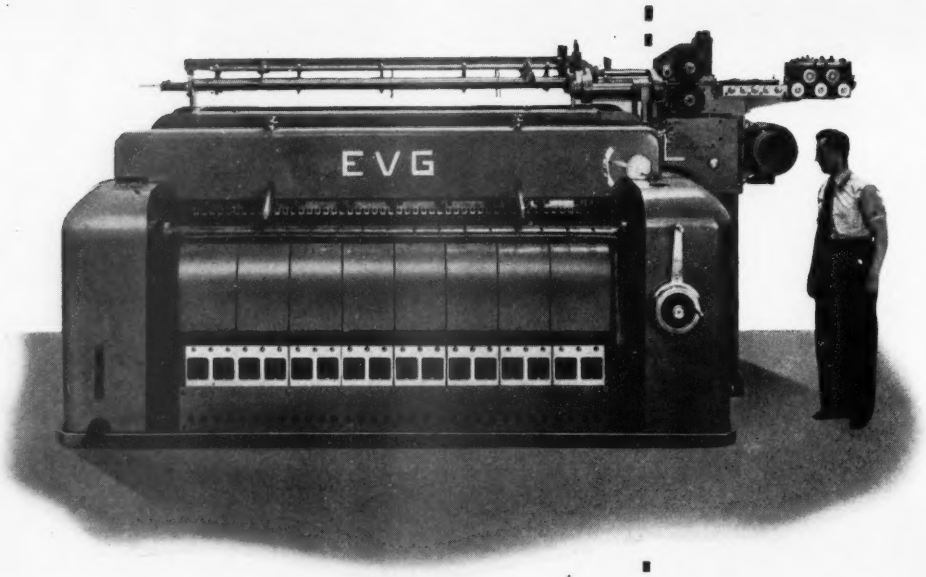
Position_____

Firm Name_____

Street Address_____

City_____ State_____

Type of Business_____



Shown in Picture: The UNIVERSAL (Model G5); available in 96", 128" and 156" widths. Wire size range in 3/0 to 11 gauge. Recommended for Road Fabric, Building Mesh.

Fully Automatic

E.V.G.

WIRE FABRIC WELDING EQUIPMENT

E.V.G., Europe's experienced builders of Wire Fabric Welding Machines, have developed a series of fully automatic, high-speed precision fabric welders. Machines are specially designed to produce each major type and size of welded mesh—from the heaviest to the lightest—suitable for reinforced concrete pipe, road slab, building mesh, fencing, hardware cloth, etc.

Wire sizes from 1/2" dia. down to 22 ga. Wire spacings from 1/2" x 1/2" upward, including all standard constructions. Speeds up to 90-100 cross wires per minute.

Accessory equipment includes:

QUICK ACTING CUTOFF SHEAR of E.V.G.'s own design; adjustable positioning; automatic or manual trip.

SHEET STACKER: automatically conveys fabric sheet by overhead trolley-bridge from welder to pile.

ROLL TAKE-UP: Incorporates all latest design features, including automatic stripping device; permits continuous operation of welder.

Full information upon request.

Engineered and Built by

ENTWICKLUNGS VERWERTUNGS GESELLSCHAFT

Graz, Austria

MASCHINEN & STAHL A.G.

Zurich, Switzerland

Please direct inquiries to

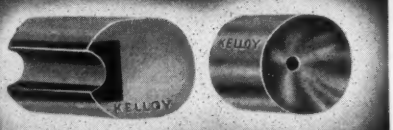
RICHARD E. KLEINHANS

Authorized Representative in the United States

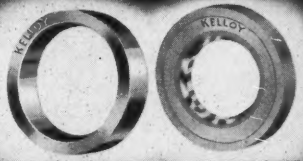
122 East 42nd Street, New York 17, N. Y. • OXford 7-0770 – 7-0771

FOR PRECISION AND ACCURACY

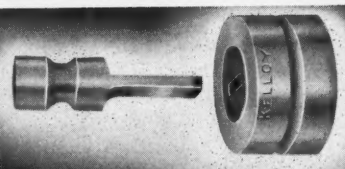
Specify "KELLOY" CARBIDE SHAPE DIES



WEAR RESISTANT PARTS. BUSHINGS, GUIDES, CRIMPING, EDGING AND COATING DIES, etc.

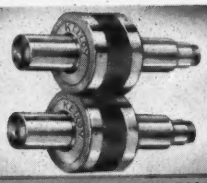


CAPSTAN RINGS FOR WIRE DRAWING OPERATIONS. FOR EYELETS & DEEP DRAWN PARTS. ANY SHAPES.

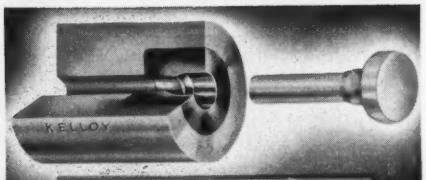


FOR COMPACTING POWDERED MATERIALS — SIMPLE AND COMPLEX SHAPES.

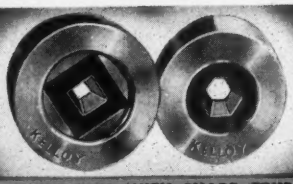
FOR SPRING FORMING. ALL TYPES OF SPRING TOOLING.



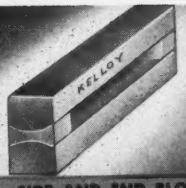
WIRE FLATTENING ROLLS. TRUE SURFACE FOR HIGH QUALITY FLAT WIRE.



BOLT SIZING DIES. COMPLETE AND READY TO USE. CLOSE TOLERANCES.



SHAPE DIES WITH SHARP TRUE CORNERS FOR ACCURATE PRODUCTION.



SIDE AND END BLOCKS. COLLAPSIBLE DIES FOR DRAWING BAR STOCK.

KELLOY CORPORATION
17 WEST 34th. STREET NEW YORK 1, N. Y.

MICROMETER PRECISION
MICRO-WELD
TRADE MARK REGISTERED

MICRO PRODUCTS COMPANY

EXTENDS HEARTY GREETINGS TO ALL

MEMBERS AND GUESTS OF

THE WIRE ASSOCIATION

MICRO-WELD BUTT WELDERS ARE MANUFACTURED IN DIFFERENT MODELS TO BUTT WELD HIGH AND LOW CARBON STEEL AND STEEL ALLOYS IN SIZES FROM .004" TO 1¼" DIAMETER, AND NON-FERROUS WIRE AND RODS RANGING IN SIZE FROM .004" TO ⅞" DIAMETER

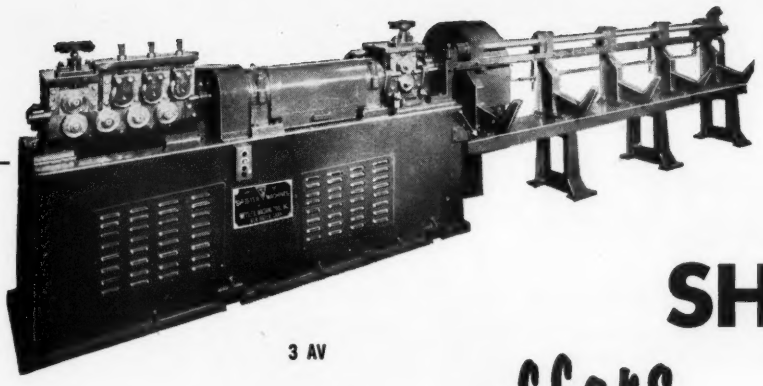
A WELDER FOR EVERY PURPOSE

DISCUSS YOUR WIRE WELDING PROBLEMS WITH OUR MR. G. L. MAY, WHO WILL BE IN ATTENDANCE DURING THE CONVENTION

MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE, CHICAGO 6, ILL.

Cable address: MICROWELD, CHICAGO **Telephone STATE 2-7468**



3 AV

90th year

SHUSTER offers most!!

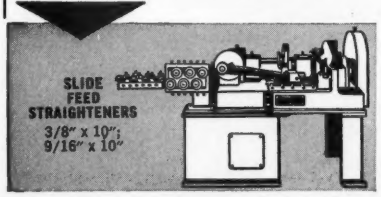
In Wire Straightening and Cutting, SHUSTER variable speed machines consistently provide the newest tested principles of operation – SHUSTER'S 90 years' know-how will cut your wire straightening and cutting costs every day!

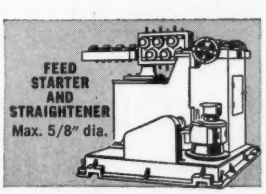
	SHUSTER	Manufacturer B	Manufacturer C	Manufacturer D
Infinite variable speed of all feed and cutoff ranges	YES	NO	NO	NO
Electrically controlled Target and Clutch	YES	Some Models	NO	NO
Power Consumption	LOW	HIGH	MEDIUM	HIGH
Complete On-The-Job Engineering service	YES	NO	NO	NO
Flat and Shape Stock Machines available	YES	YES	NO	NO

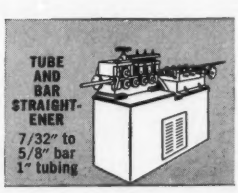
SHUSTER – the *first* name (since 1866) in Wire Straightening and Cutting, offers *more* production features, at less investment and operating cost, than have ever been available in the field!

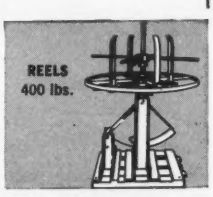
METTLER
MACHINE TOOL, INC.
155 West Adeline Street, New Haven, Conn.

This too is SHUSTER.









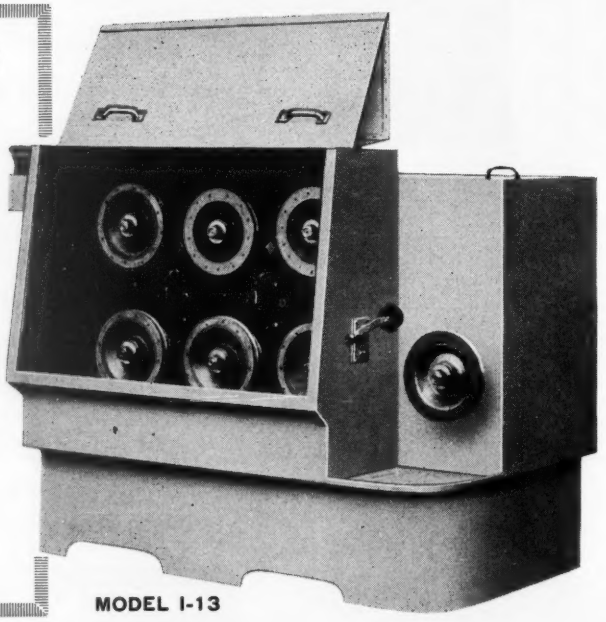
designed by COOK MFG. CO. *"draws out the best in wire"*

INTERMEDIATE WIRE DRAWING MACHINE

specifications:

Maximum Size of Entering Rod	#8 B&S Gauge
Finished Wire Size	#18 to 26 B&S Gauge
Maximum Operating Speed	5,000 ft./minute
Maximum Number of Dies	13
Number of Drawing Blocks	6
Maximum Size of Die Case	1½" dia. x 1" thick
Spool Capacity	500 to 1,000 lbs.
Spool Traverse	11"
Spool Diameter	30"
Motor Size	75 HP

- All welded construction and built of heavy steel plate (as is all Cook Equipment). Conveniently arranged dies permit quick and easy string-up. Main drive motor is coupled to machine.



MODEL I-13

The COOK Heavy Duty Rod Breakdown Machine, Model D-13

specifications:

Maximum Size of Entering Rod	5/16" Copper 3/8" Aluminum
Finished Wire Size	#8 to 16 B&S Gauge
Maximum Operating Speed	5,000 ft./minute
Maximum Number of Dies	13
Number of Drawing Blocks	6
Maximum Size of Die Case	1½" dia. x 1" thick
Spool Capacity	1,000 lbs.
Spool Traverse	11"
Spool Diameter	30"
Motor Size (maximum)	200 HP

MODEL D-13

- **Our Engineering Dept. is at your service to assist you in the solution of your wire problems—at no obligation of course.**

A Complete Line of Quality Machinery For The Wire and Cable Industry To Meet Rigid Specifications.

COOK MANUFACTURING CO.

50 EAST 25TH STREET, PATERSON, N. J. • ARMORY 4-6380

GRANODRAW SS®

-unique oxalate coating process

facilitates cold forming of stainless steel, eliminates leading and de-leading operations

The absorbent crystalline coating produced by this ACP process is chemically bonded to the pickled and activated metal surface and acts as a carrier for suitable lubricants. The combination of the Granodraw SS coating and lubricant greatly improves production and product quality in such cold forming operations as drawing of wire, bars and tubing; cold shaping; deep drawing; cold heading; ironing; necking; extruding; and upsetting. Among the other advantages of the Granodraw SS coating is the elimination of leading and de-leading operations; the storing of coated products indefinitely without breakdown of the coating or pitting of the base metal; and the short coating cycle. For complete information about Granodraw SS, write ACP today.

AMERICAN CHEMICAL PAINT COMPANY, Ambler 30, Pa.

DETROIT, MICHIGAN ST. JOSEPH, MISSOURI NILES, CALIFORNIA WINDSOR, ONTARIO

CHEMICALS ACP PROCESSES

wires that fish

In addition to wire for the traditional bent pins, CF&I-Wickwire makes a wire that's a real pro at fish catching. It's the special spring steel wire used to make fish hooks. Heat treated so it's soft and ductile, this high carbon steel wire can be severely deformed by fish hook makers, then heat treated again to give the finished hook a spring-like quality and hardness.

Chances are you don't need wire to make either pins or fish hooks. But *you may need one or more of the nearly 100 different categories of specialty wire for which CF&I-Wickwire is famous.* Let us show you how we can meet your most rigid chemical and physical specifications on high and low carbon wire in all sizes, shapes, tempers, finishes and grades.

Check This List!

FOR THE WIRE YOU REQUIRE, SEE CF&I-WICKWIRE.

FLAT AND SHAPED WIRES
Armor Wire
Bobby Pin Wire
Bookbinder Wire
Brush Wire
Casing Wire
Cotter Pin Wire
Curtain Spring Wire
Die Spring Wire
Gutter Broom Wire
Lock Spring Steel
Rake Tine Steel
Regulator Spring Wire
Snake Fishing Steel
Stapling Wire for Preformed Staples (Flat)

LOW CARBON FINE AND SPECIALTY WIRE
Bee Wire
Bonnet Wire
Bookbinder Wire
Broom Wire
Clip Wire
Dent Spacer Wire
Drapery Pin Wire
Florist Wire
Fuse Wire
Glass Netting Wire
Hairpin Wire
Hook and Eye Wire
Mattress Wire
Picture Cord Wire
Picker Tooth Wire
Pin Ticket Wire
Pin Wire
Ring Traveller Wire
Spiral Binding Wire
Stapling Wire
Stapling Wire for Preformed Staples
Stone Wire
Weaving Wire
Weaving Wire for Fly Screen Cloth
Wissco Iron Wire

HIGH CARBON FINE AND SPECIALTY WIRE
Aircraft Cord Wire
Armor Wire
Belt Hook Wire
Bobbin Ring Wire
Brush Wire (Tempered and Untempered)
Brush Wire (High Strain)
Chrome Vanadium Spring Wire
Core Wire (Aluminum Cable Steel Reinforced)
Curtain Spring Wire
Flexible Shaft Wire
"Gamma" Spring Wire (Upholstery Spring Wire)
Zig Zag Wire
No-Sag Wire
Hat Wire
Heddle Wire
Hose Reinforcement Wire
Hose Wire, Mechanical
Hose Wire, Vacuum and Defroster
Rope Wire
Signal Corps Wire
Spoke Wire
Hard Drawn Spring Wire
Oil Tempered Wire
Spheroidized or Annealed Spring Wire
Tire Bead Wire
Valve Spring Wire

MANUFACTURERS LOW CARBON COARSE WIRE
Bag Tie Wire
Basket Handle Wire
Box Binding Wire
Brush Handle Wire
"Cal-Tie" Wire
Can Key Wire
Case Hardened Ball Wire
Chain Wire
Clamp Wire
Clothes Pin Wire
Concrete Wall Reinforcement Wire
Garment Hanger Wire
Hay Baling Wire (Coiled)
Lingo Wire
Lintel Wire
Loop Wire
Merchant Quality Wire
Pail Bail Wire
Rivet Wire
Stapling Wire
Strand Wire
Tying Wire
Welding Wire
Wissco Iron Wire
Industrial Quality Wire
Cold Rolling Quality Wire
Heading, Forging or Roll Threading Quality Wire
Medium High Carbon Wire

CF&I-WICKWIRE WIRE

THE COLORADO FUEL AND IRON CORPORATION

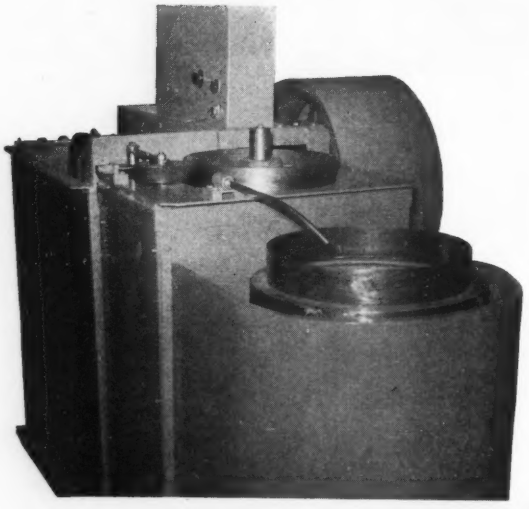
THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Casper Denver • El Paso • Ft. Worth • Houston • Kansas City • Lincoln (Neb.) • Oklahoma City • Phoenix Pueblo • Salt Lake City • Wichita • PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland San Francisco • Seattle • Spokane • WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo Chicago • Detroit • New Orleans • New York • Philadelphia • CF&I OFFICE IN CANADA: Toronto
CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg

CF&I

4240

THE FEDERAL MANUFACTURING CO. WALLINGFORD, CONN.

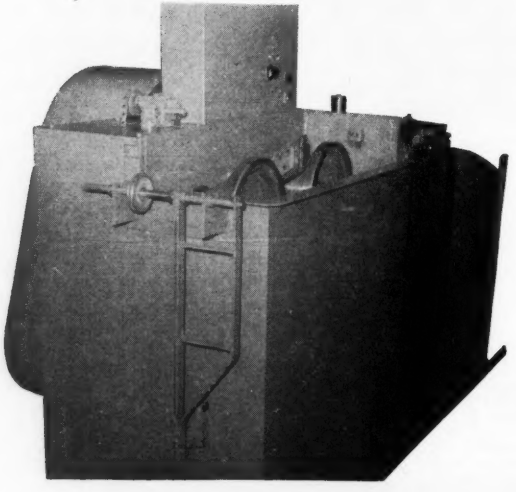
WIRE MACHINERY • TESTING EQUIPMENT



It's in the **BARREL!!**

"PAYOFFPAK"

by **FEDERAL**



FEATURING

- **Slo Start**
- **Triple Life Carriers**

With or without Drawing Machine

* * *

OTHER *Federal Manufacturing Co.* PRODUCTS

Payoffs - Takeups - Captans - Re-Spoolers - Patching Moulds
Measuring Machines - Payoffpak

TESTING EQUIPMENT

FOR INSULATED WIRE

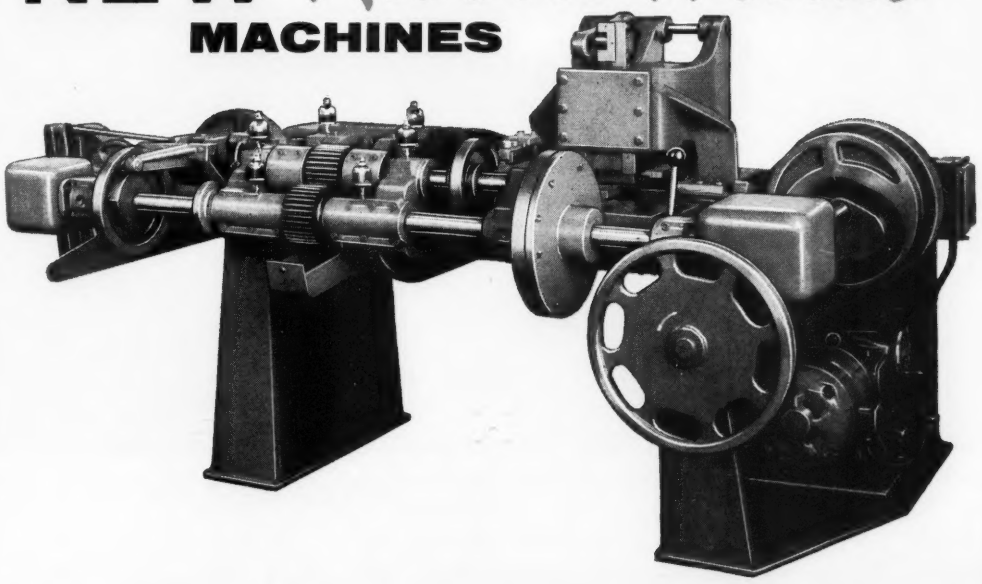
- ★ **Dielectric**
- ★ **High Potential**
- ★ **Continuity**

FOR ENAMELED WIRE

- ★ **Dielectric**
- ★ **Continuity**
- ★ **Abrasion Scrape**

...ask BAIRD about it

NEW *Ribbon Metal* MACHINES



Open UNEXPLORED opportunities for cost reduction in manufacture of a wide range of parts.

- HIGH SPEED
- UNIFORM PRODUCT
- LOW TOOLING COST
- EASY MAINTENANCE
- SIMPLE OPERATION
- UNLIMITED RANGE

If you are producing small . . . or even quite large . . . formed parts out of ribbon wire or metal strip up to about 2″ wide, it will most certainly pay you to "ask Baird about it." More and more quality and cost-conscious manufacturers are finding that our NEW model Automatic High Speed Ribbon Metal Forming Machines are the ideal "production line" for such products.

Behind these machines are years of successful application to a range of work "limited only by the ingenuity of the men who design the tooling." NEW models include a host of important improvements and additional features which greatly extend the range of work and tooling possibilities. For example, what is essentially a substantial press is built right into the machine and is capable of maintaining precision in high-speed production. Baird's unique two-to-one feeding mechanism and EASY cam motions, combined with the fact that 3/4 of the cycle is available for forming rather than the usual 1/2-cycle, permits far greater latitude in combining operations and complexity of possible forms.

Our Engineering Department will be glad to give you further detailed information or to submit recommendations on parts or prints of your product. Write Dept. WP.

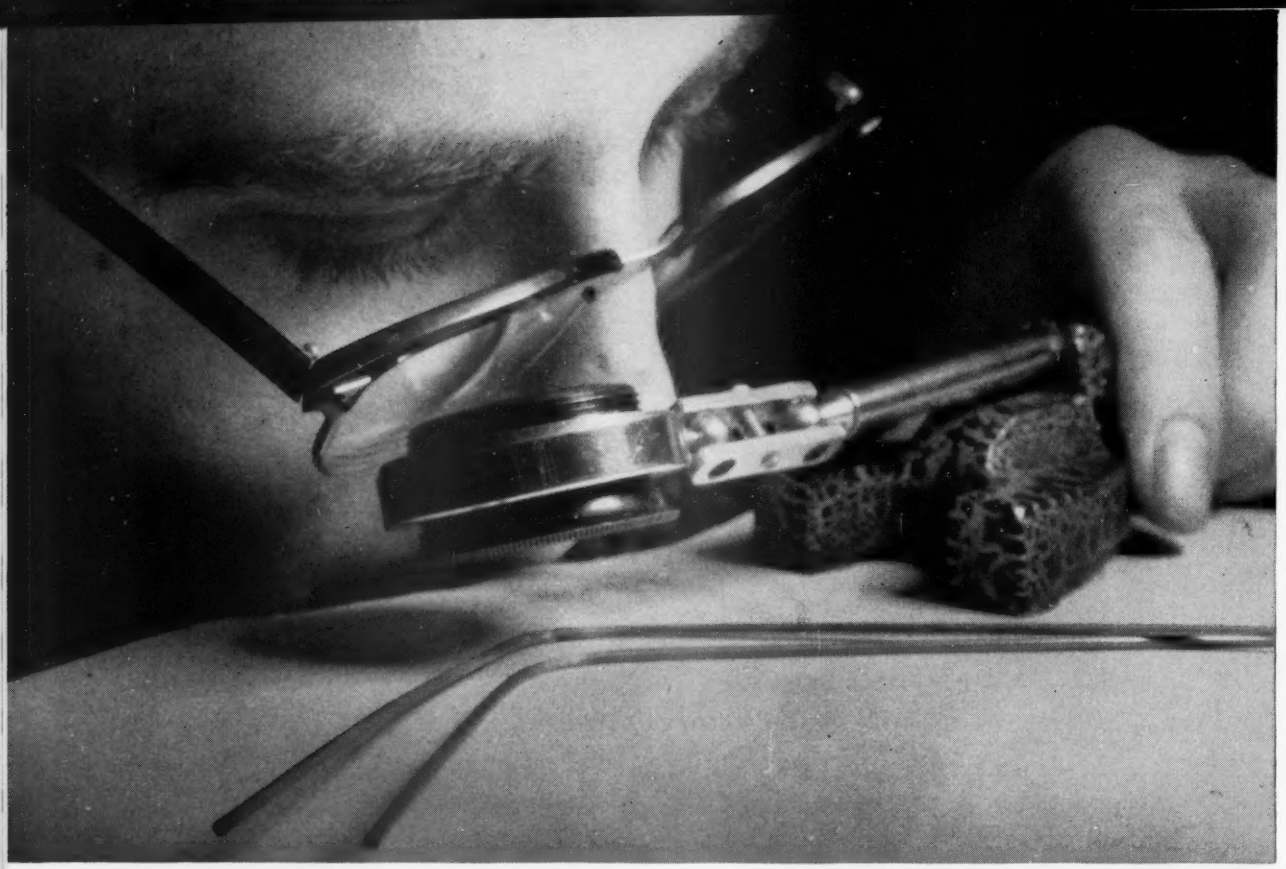
Interested in Deferred Payment? . . . "ask Baird about it."

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

THE BAIRD MACHINE COMPANY

STRATFORD CONNECTICUT

7BA56



The Connecticut Spring Corp. imposes rigid standards which Johnson Steel & Wire Co.'s Music Wire meets.

They Use Electronics To Build Steel Springs

Connecticut Spring Corporation Uses Johnson Music Wire To Do "The Impossible"

Photo shows 97 springs on a dime with plenty of room to spare, illustrates why The Connecticut Spring Corp. has introduced electronics into production.

What was long considered impossible in the intricate manufacture of precision steel springs—use of electronic production controls—is being done daily in the Hartford plant of The Connecticut Spring Corporation.

Electronics are being used in production of one spring so small that 100 of them fit on a dime easily.

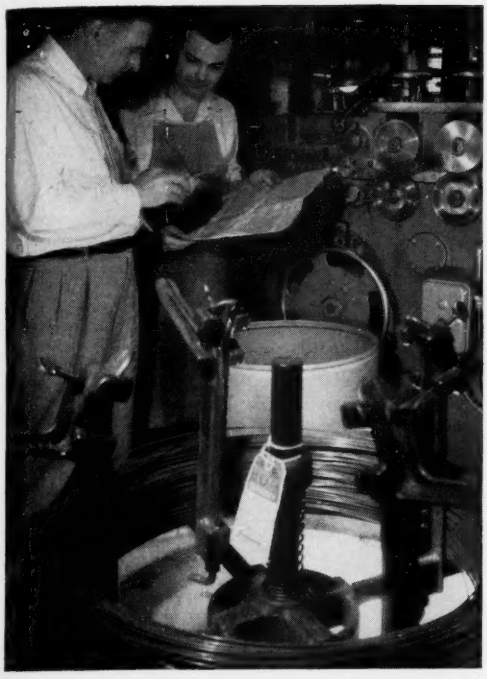
Electronic devices are doing several production jobs for The Connecticut Spring Corp. to protect the company's reputation for quality.

But electronics, as company officials will quickly tell you, only measure quality, not create it.

Quality in a steel spring starts with the wire. That's why Connecticut Spring, one of the largest specialty fine wire users in the East, has been a Johnson Steel & Wire Co. customer since starting business 20 years ago.

"Our experience with Johnson wire has been satisfactory in every respect," says John A. Torda, general sales manager.

Electronic scanning of springs too



John Torda, sales manager, left, checks drawings to see that spring being wound meets specifications.

Numerous quality tests are performed on the aircraft spring to insure that it can perform its vital function in plane's fuel system.

small to be measured manually is just one precaution the company takes. Its toughest job—a precision compression spring for the carburization system of a reciprocating aircraft engine—illustrates the firm's exacting emphasis on quality.

This aircraft spring weighs only half an ounce but controls the fuel flow in the engine.

The spring is tapered from a top O.D. of 1 inch to a bottom ⅝ inch O.D. Free length is 1½ inches with 8½ coils. Made to Aircraft Material Specification 5112, the spring uses Johnson's .090 Music Wire.

Johnson conducts its own rigid inspection before shipping from its Worcester, Mass., mill to certify the wire meets AMS demands.

Connecticut Spring could get by on this certification. Instead, it conducts its own complete test of physical properties and then trial runs a sample piece of wire from each lot.

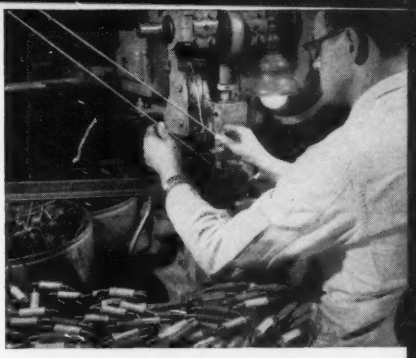
The aircraft spring goes through heat treating and brazing operations. It must meet precise load specifications, thus its tensile strength must be exact. Specifications permit only one degree of squareness. Load values have a plus or minus tolerance as limited as .003 to .008.

Connecticut buys every size range of Johnson's Music Wire, starting at .003 and going to .300.

For its complete product line, Connecticut relies on both Johnson and its parent Pittsburgh Steel Company.

The wire mills of Pittsburgh Steel have become major supplier of hard-drawn MB wire used to make double counter-balance springs for steel cellar doors. Pittsburgh also supplies oil-tempered MB wire for transformer base mounting springs.

Whatever the wire application, Johnson Steel & Wire Company and Pittsburgh Steel Company can serve you. From aircraft cord wire to tire bead wire made by Johnson through oil-tempered, hard-drawn, low-carbon or core wire from Pittsburgh Steel, the team of wire specialists stands ready to serve you. Call in a wire specialist from Johnson or Pittsburgh today for a talk about your wire problems.



Pittsburgh Steel's hard-drawn MB wire is used by Connecticut Spring for cellar door counter balance door spring. Here wire gets two bends.

Three coils are wound into each side of spring. Pittsburgh Steel has been major supplier for this product since production started.

Ready for installation. Tensile strength of wire (Pittsburgh's .218) is vital.

We're looking forward to seeing you . . .

at the 1956 annual convention of the Wire Association in Pittsburgh Oct. 29-Nov. 1, and hope you can make the scheduled tour of our plant.

Johnson Steel & Wire Company, Inc.

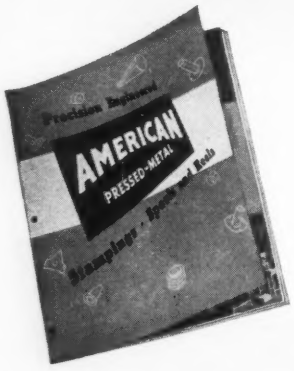
Worcester 1, Massachusetts

***a subsidiary of* Pittsburgh Steel Company**

Grant Building • Pittsburgh 30, Pa.

District Sales Offices

Atlanta	Columbus	Detroit	New York	Tulsa
Chicago	Dallas	Houston	Philadelphia	Warren, Ohio
Cleveland	Dayton	Los Angeles	Pittsburgh	



Send for your free copy of our latest bulletin on American Pressed-Metal Spools and Reels. It contains full details and charts on the many standard types.

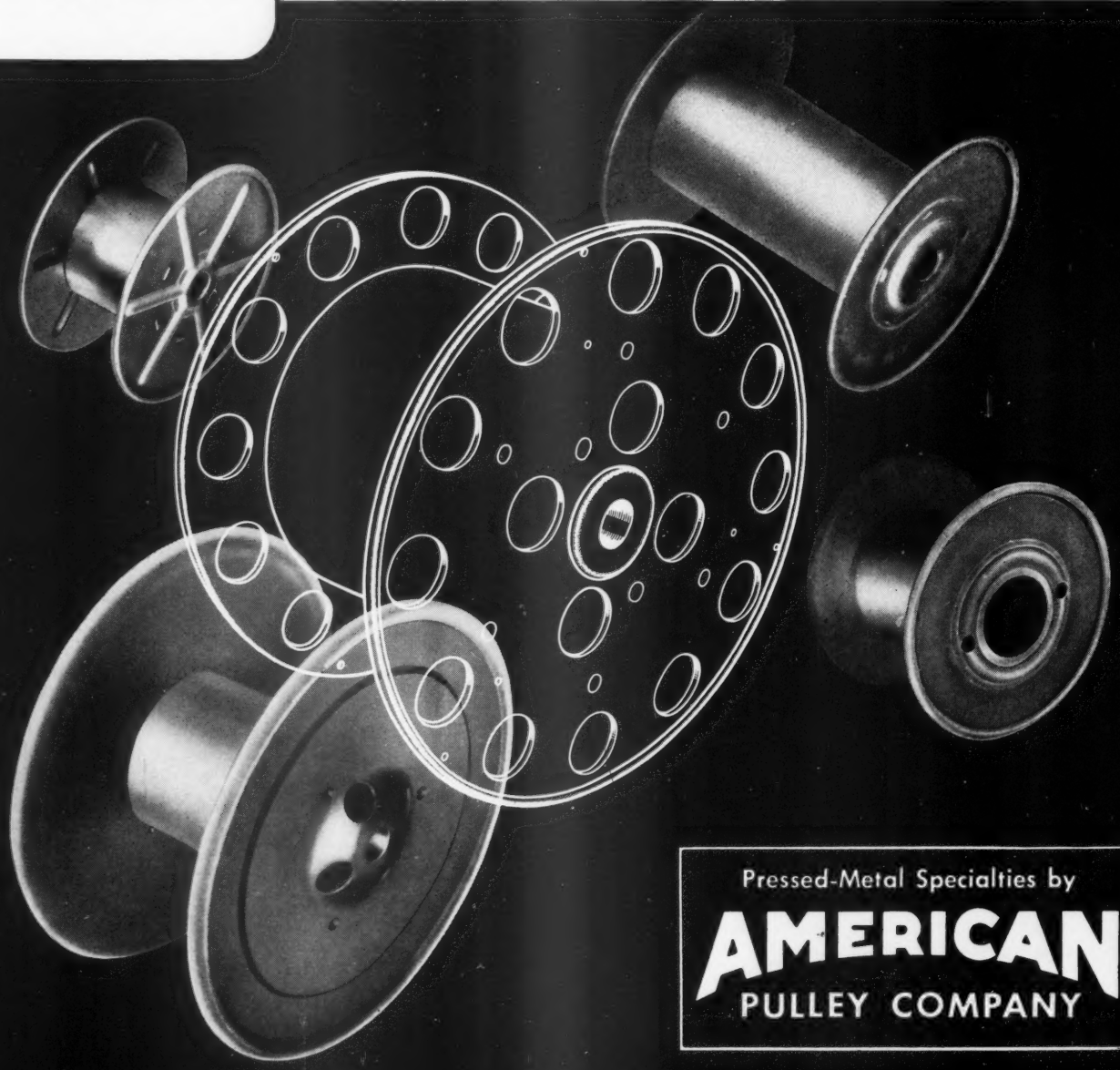
For shipping or processing spools and reels get exactly what you want from American Pulley

Name your need . . . there's an American pressed-metal reel or spool to meet it. And if our long list of standard sizes doesn't contain the model you need, we'll custom-build one to your exact requirements.

American pressed-metal spools and reels are practically indestructible—won't crack, chip or warp. They offer the added advantages of light weight, cleanliness and strength.

Almost 60 years' experience in design and manufacture—plus a vast assortment of tools, dies and other facilities for making all types of spools and reels to strict custom specifications—are at your service.

Send us your specifications, blueprints or merely tell us what you need and we'll design from scratch. You'll find our quotations fast, realistic and offering you good value for the money. The American Pulley Company, 4242 Wissahickon Ave., Philadelphia 29, Pa.

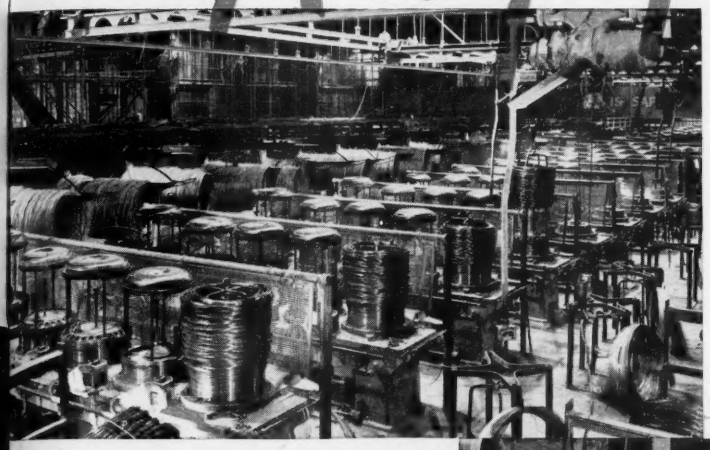


Pressed-Metal Specialties by

AMERICAN

PULLEY COMPANY

EACH INSTALLATION *A top producer!*

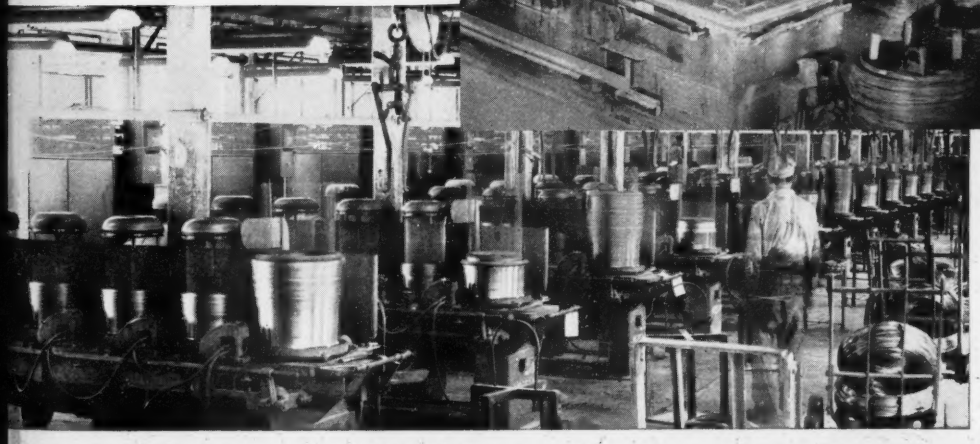


Yes, the proof is in the production—and Morgan-Connor Wire Machines have an international reputation as high volume producers.

The Morgan-Connor all air-cooling method and no-slip storage principal rapidly remove heat from the wire. Exacting specifications are met at high speeds.

Sheffield Steel Division
Armco Steel Corp.
Kansas City, Missouri

Laclede Steel Company
Alton, Illinois



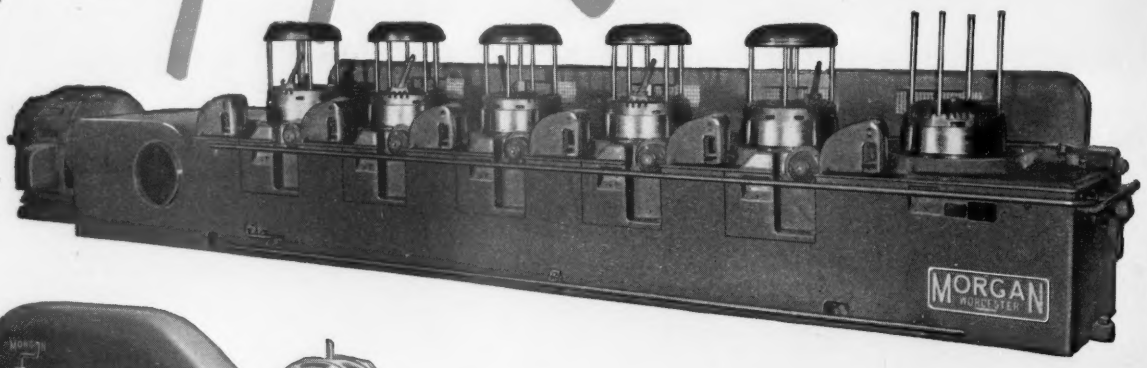
Wickwire Spencer Steel Division
Colorado Fuel and Iron Corp.
Palmer, Massachusetts

MORGAN-CONNOR
WIRE MACHINES

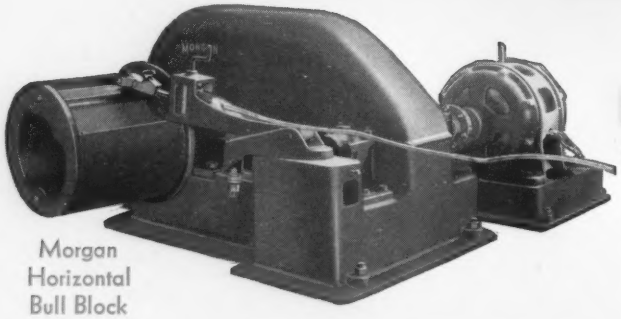
TURN TO MORGAN-CONNOR MACHINES

EVERY MACHINE

A top performer!

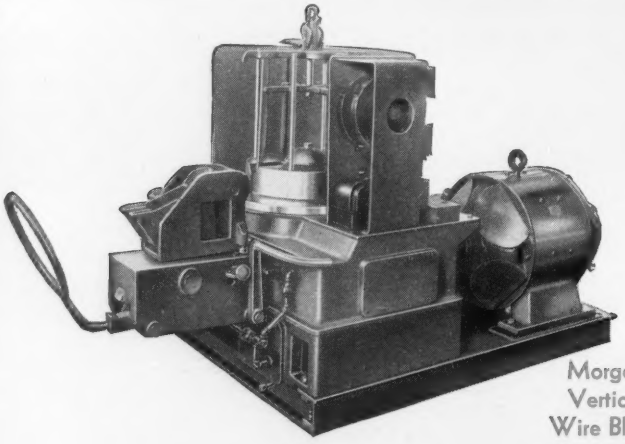


Type BW
Morgan-Connor
Wire Machine



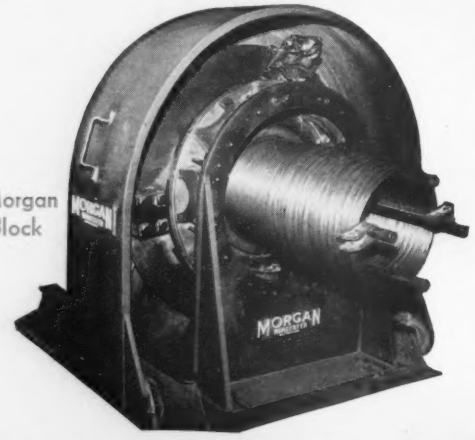
Morgan
Horizontal
Bull Block

Economy of Floor Space



Morgan
Vertical
Wire Block

High Production



New—Morgan
Dead Block

Long Die Life

Safety afforded the Operator

MORGAN-CONNOR
WIRE MACHINES

Morgan Construction Company WORCESTER, MASS.

ROLLING MILLS • MORGOIL BEARINGS • REGENERATIVE FURNACE CONTROL • EJECTORS • GAS PRODUCERS

Help your customers **INCREASE RATINGS... DECREASE SIZE** of electrical equipment—

Use G-E *Alkanex*® wire enamel!

Heat-resistant General Electric Alkanex wire enamel offers your customers a chance to achieve significant reductions in the size and weight of electrical equipment. This new insulation allows equipment to operate at least 35°C above Class A (105°C) temperatures with a substantial margin of safety for overload conditions.

Using wire coated with Alkanex enamel, your customers can design motors, controls and other equipment with far greater latitude in temperature limitations. Higher-temperature equipment, previously requiring bulkier insulated magnet wire, can now be redesigned to take advantage of this space-saving insulation.

Tough and flexible

In addition to its ability to take severe thermal punishment, wire coated with G-E Alkanex enamel is tough and flexible and withstands the abuse of automatic winding equipment. It resists a wide range of chemicals and environmental conditions.

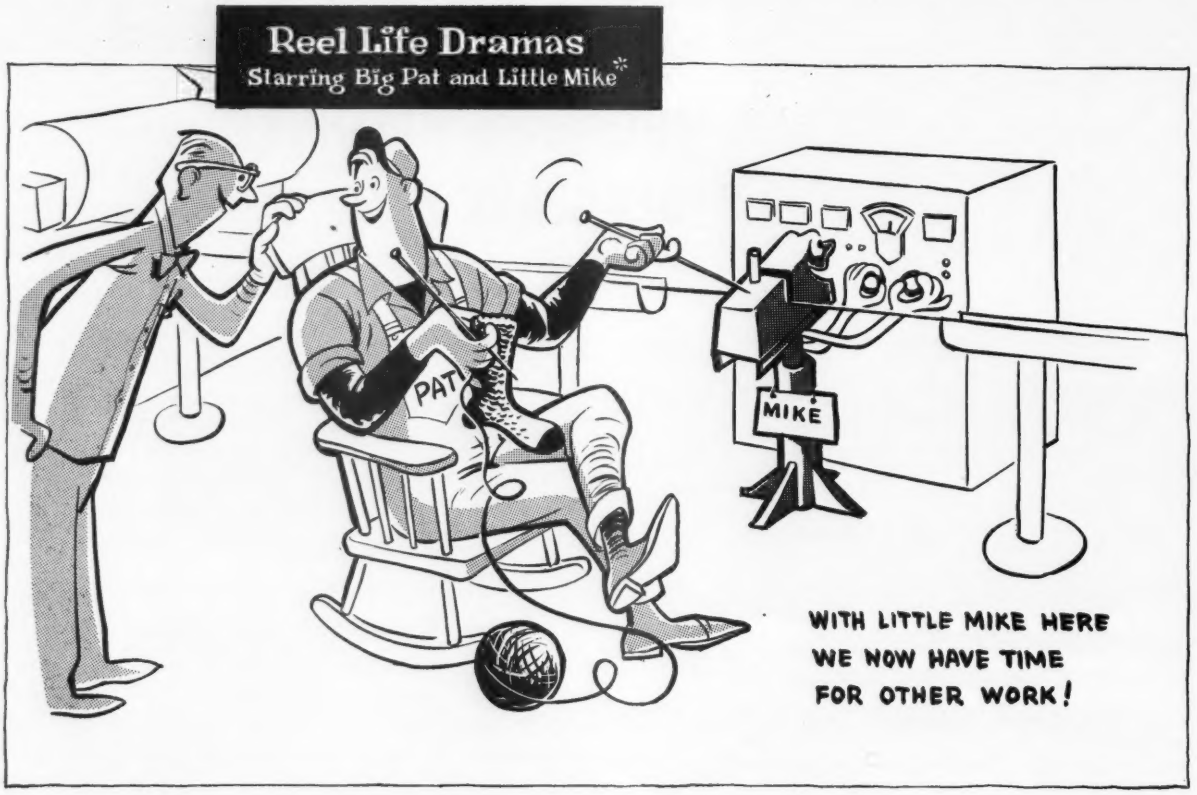
A result of G-E chemical progress

This thin-film, higher-temperature insulation represents a major step in G.E.'s never-ending efforts to help the electrical industry make superior products . . . to achieve "more power-per-pound"!

Information on Alkanex wire enamel is available from General Electric Co., Section WWP, Chemical Materials Department, 77 River Road, Schenectady, New York

Progress Is Our Most Important Product

GENERAL ELECTRIC



INSULATED WIRE MANUFACTURERS

REDUCE LABOR COSTS

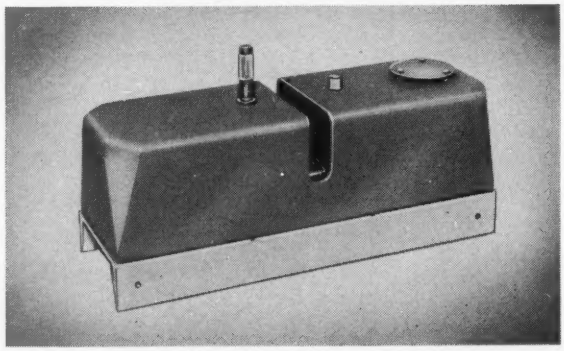
How? In two ways:

(1) With MICROLIMIT CONTROL monitoring and controling wire diameter, your operators can safely go about other essential work and housekeeping duties.

(2) You can reduce training time for new operators since you don't have to teach them to read diameter "on the fly." The periods of close supervision can be cut by as much as 50% — freeing your foreman for better performance of their other duties.

With MICROLIMIT CONTROL your men can utilize their time more efficiently!

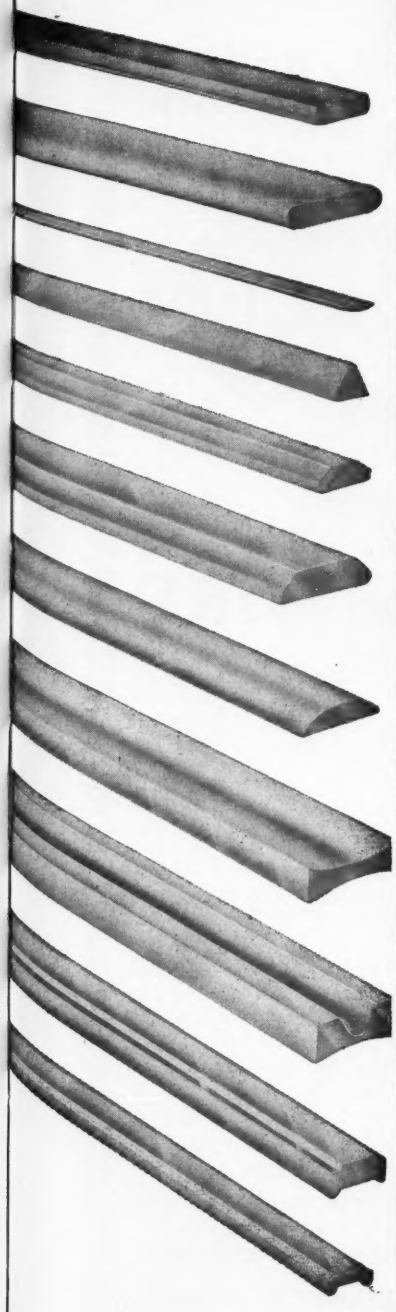
IGC's MICROLIMIT CONTROL also enables you to reduce your scrap costs and compound consumption, and at the same time *improve the quality of your product.*



*LITTLE MIKE IS IGC'S MICROLIMIT CONTROL

For further information . . .

INDUSTRIAL GAUGES CORPORATION • WEST ENGLEWOOD, NEW JERSEY



NATIONAL

WIRE

(COLD ROLLED)

in Coils or Straight Lengths

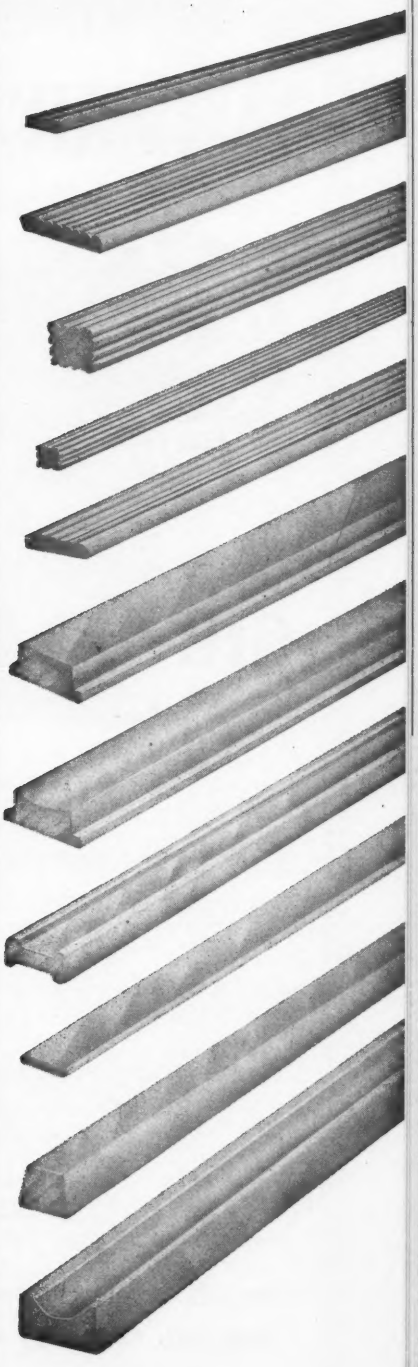
COMPLETE METALLURGICAL SERVICE

Manufacturers of

SPRING WASHERS	RETAINING RINGS
ROUND EDGE FLAT WIRE	KEYSTONE SHAPED WIRE
SQUARE EDGE FLAT WIRE	SPECIAL SHAPED WIRE

Shaped Wire in Coils or Straight Lengths, Ferrous or Non-Ferrous.

LARGE OR SMALL QUANTITIES



Manufactured by

THE NATIONAL LOCK WASHER COMPANY

PRECISION SHAPED WIRE DIVISION

NEWARK 5, N. J. MILWAUKEE 2, WIS. U.S.A.

INTERNATIONAL *Fine Wire Co., Inc.*

Precision Wire Drawn

to

Your Specifications

SILVER PLATED COPPER WIRE

Concentric Stranded, Bunched and Single End. 1¼-1½ to 4% Silver Coated on Copper by weight. Amount of Silver accurately controlled for thickness and purity to meet U.S. Government specifications.

Constructions supplied to your special design.

WE ALSO SUPPLY:

NICKEL • NICKEL PLATED WIRE • RESISTANCE WIRES • MONEL • COPPER AND ALL TYPES OF STAINLESS STEELS—BOTH SINGLE END AND STRANDED FORMS

In Special Tempers, Annealed and Stranded
To Engineering Specifications for Military Use.

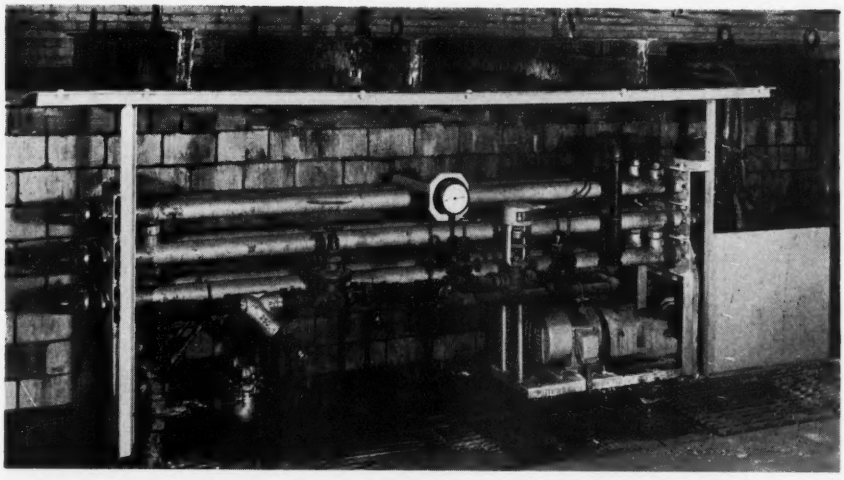
1 GREENWOOD AVENUE • MIDLAND PARK • NEW JERSEY

Telephone Gilbert 4-2151

For EFFICIENCY and MAXIMUM ECONOMY in your PICKLING OPERATIONS, use...

NUKEM HI TEMP HEAT EXCHANGERS!

Designed for Heating or Cooling of Pickling, Lime, Flux, and other Chemical Solutions.



This NUKEM HI TEMP MODEL 69 HEAT EXCHANGER is one of several **IN ACTION** heating sulfuric acid pickling tanks of a MAJOR WIRE MILL in the Mid-West; all brickwork shown features NUKEM materials and construction.

COMPARE THESE FEATURES OF THE NUKEM HI TEMP HEAT EXCHANGER WITH OTHER MODES OF HEATING

√ **REDUCED ACID CONSUMPTION** for the same tonnage processed; this appreciable economy results from the termination of **acid dilution** by steam condensation—ending ACID WASTE and OVERFLOW problems simultaneously.

√ **CONTINUOUS CIRCULATION OF SOLUTION** keeps hydrogen nests in motion and as a result, **faster and cleaner pickling.** This circulation also assures you of **uniform temperature** throughout your acid tank.

√ **ELIMINATION** of damage to interior lining of tank by live steam, thus **longer tank life.**

√ **CURTAILED** vapor loss and fuming. Result: Improved working conditions and a reduction of corrosion on adjacent equipment and areas.

√ **CONTROLLED TEMPERATURES** and steam consumption—made possible by temperature controls and steam traps.

√ **MAXIMUM HEAT TRANSFER EFFICIENCY**—meaning LESS heating surface needed for the job and MORE economy.

√ **MAINTENANCE COSTS** decreased considerably by utilizing this model of heating. This is a fact reported by customers.

Best of all, these features of the NUKEM HI TEMP HEAT EXCHANGER do not represent a copywriter's fancy—they are based on established and uniformly successful EXPERIENCE in field installations! Introduced in its present design in 1953, these efficient units can be found in many progressive wire and steel mills today—all performing with reliable consistency. Maintenance of this equipment?—Very moderate in all cases, and considerably less than that of the equipment used in other heating systems! Literally, these NUKEM HI TEMP UNITS are dividend-paying investments.

Plan NOW to investigate the possibilities of NUKEM HEAT EXCHANGERS for YOUR operations. They are designed, produced, and sold by NUKEM—a name synonymous with quality in the field of corrosion proof equipment. Write for information today.

Nukem

NUKEM PRODUCTS CORPORATION

121 COLGATE AVENUE **BUFFALO 20, N. Y.**

ACID AND ALKALI PROOF DESIGN • CONSTRUCTION • SUPERVISION • BRICK • CEMENTS • COATING • FLOORS SEWERS • TANKS • HEAT EXCHANGERS • PUMPS • RUBBER LININGS • PIPE FITTINGS SPECIAL FORMULA CEMENTS

Cold-formed parts by the million—

yet dies stay like new!

The secret:

FOS lubrication by Pennsalt

The way to fast, efficient cold forming—with minimum rejects, long die life, and cost savings as high as 50% —is through the thorough lubrication provided by Pennsalt's FOS Process. Specialized FOS lubricant systems assure the vital separation of cold-forming wire from the dies, preventing welding and galling . . . boosting press production . . . saving tools and materials.

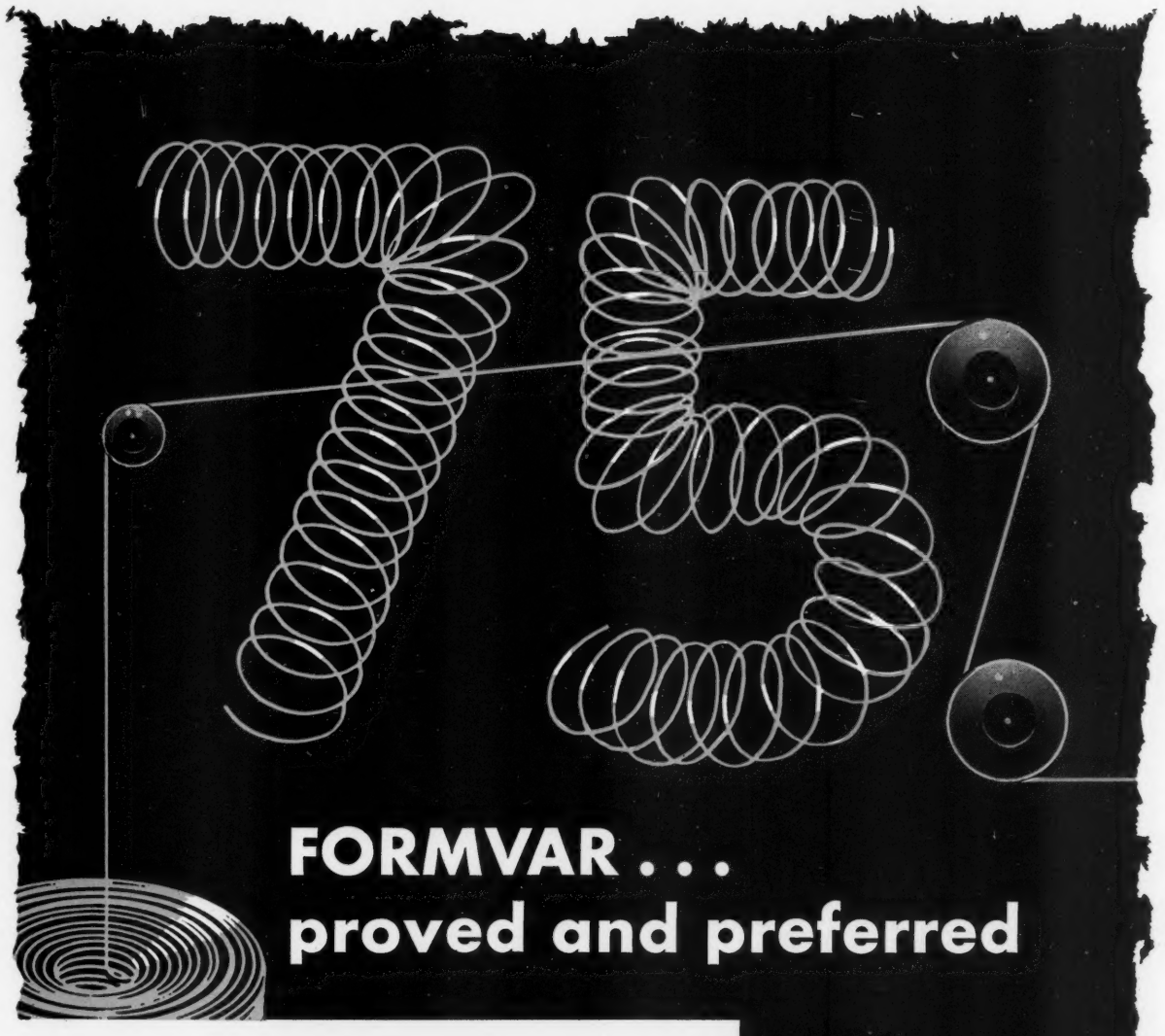
WHAT'S THE FOS PROCESS? A method offering the most comprehensive selection of phosphate coatings and organic lubricants ever designed for cold-working applications. Pennsalt FOSCOAT®, DRAWCOTE®, and FOSLUBE® products have been developed for every forming operation from severe deep drawing and extrusion to simple cold heading.

CALL ON PENNSALT'S EXPERIENCE in metalworking chemistry for advice on your cold-forming lubricant needs. Hear what your Pennsalt service man has to say about FOS, or write Metal Processing Department 267, Pennsylvania Salt Manufacturing Company. East: Three Penn Center Plaza, Philadelphia 2, Pa.; West: 2020 Milvia Street., Berkeley 4, Calif. In Canada: Pennsalt Chemicals of Canada, Hamilton, Ontario.

Pennsalt Chemicals

Metal Cleaners • Phosphate Coatings • Cold-Working Lubricants

A BETTER START FOR YOUR FINISH



FORMVAR . . .
proved and preferred

Approximately 75% of all magnet wire used today is coated with Formvar-phenolic enamel. Wire enamellers, motor manufacturers and motor users rely on Formvar in their processes and on their products. Formvar has proved its value and has established a long record of dependability.

Formvar is the registered trademark for polyvinyl formal resins produced and sold only by Shawinigan Resins Corporation. When combined with a phenolic resin it becomes that tough, heat resistant wire enamel popularly known as "Formvar enamel" . . . the industry standard.

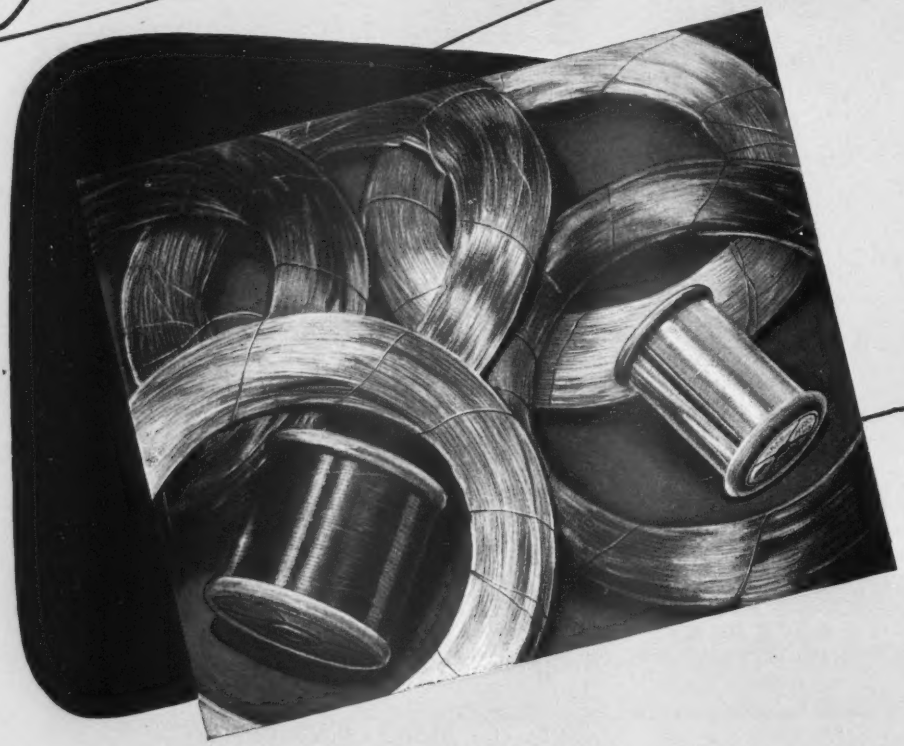
Extension of this distinguished record is the purpose of Shawinigan's exacting production controls and active research into variations of the basic formulæ. A recent example of progress in this area is the combination of Formvar and isocyanates for low temperature solderability. Look to Shawinigan and Formvar for further progress. Shawinigan Resins Corporation, Department 5310, Springfield 1, Massachusetts.

FORMVAR® *for wire enamels by . . .*

SHAWINIGAN RESINS

Are you interested

in the production of BRIGHT wire with flawless surface finish?



Then you owe it to yourself to investigate the

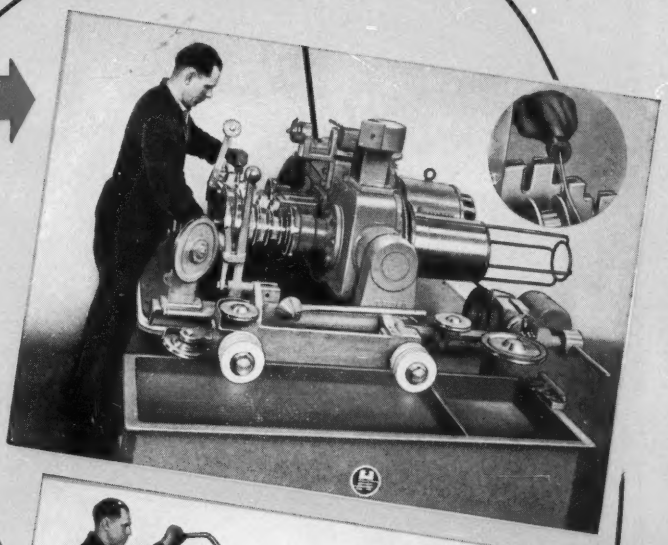
HERBORN High-Efficiency Continuous Wire Drawing machines operating under the SUBMERGED SYSTEM.

The entire drawing process takes place while the wire, the drawing dies, and the drawing rings are totally immersed in the drawing solution. The wire produced under this process is of uniform, high quality with a clean, bright finish which lends itself admirably to subsequent finishing operations, such as galvanizing, tinning, lacquering and insulating.

The operation

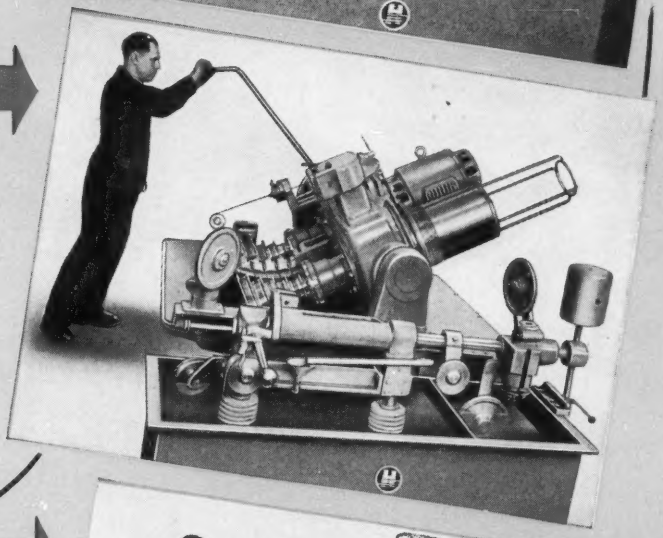
of these machines is as simple as A, B, C:

A)



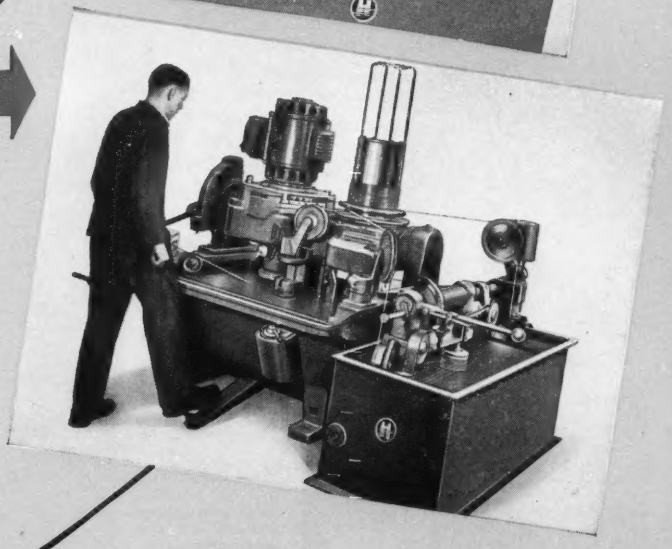
The machine in string-up position. Note how easily and comfortably all working parts of the machine (dies, drawing rings etc.) are accessible to the operator.

B)



The machine being tilted into the drawing solution. Note how carefully the machine is balanced so that it will swing on its mainshaft with practically no effort at all on the part of the operator.

C)



The machine locked into drawing position, ready to operate.

These machines are suitable for the economic production of

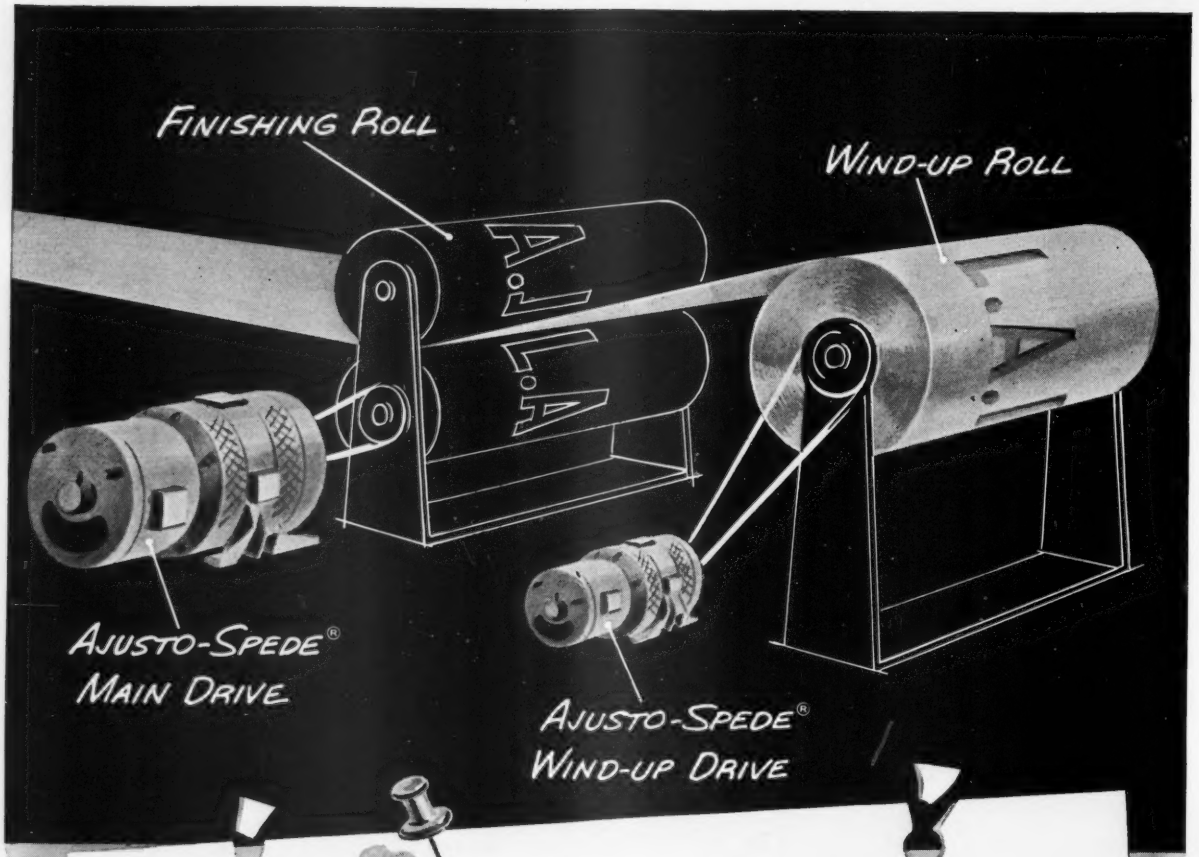
Iron Wire,
Steel Wire,
Copper Wire.

We solicit your inquiries and shall be glad to submit quotations.

MASCHINENFABRIK HERBORN BERKENHOFF & DREBES A.-G. **HERBORN/DILLKREIS**
GERMANY

Sole Representative in the U. S. A.:

KURT ORBAN CO., Inc., 34 Exchange Place, JERSEY CITY 2, N. J.



Do you have a Wind-up Problem?

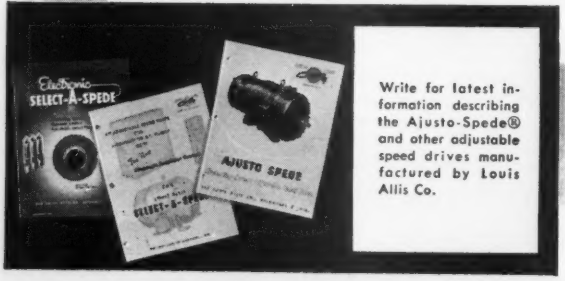
The Louis Allis Ajusto-Spede® Drive gives you the best answer

The Ajusto-Spede® drive has solved many difficult wind-up problems--has successfully handled a wide range of materials from cigarette paper to steel. Just look at the versatility of this drive--what it can do for you:

- Linear speed range from 100 to 2000 fpm.
- Roll build-up ratios up to 15:1.
- Tensions from 1/2 lb to 10 lbs per inch of width.

But that's not all. No dancer roll is required. An AC signal generator, mounted on the main drive, corrects for changes in linear speed. A special circuit provides inertia compensation during periods of acceleration or deceleration. Adjustable stalled tension is also provided.

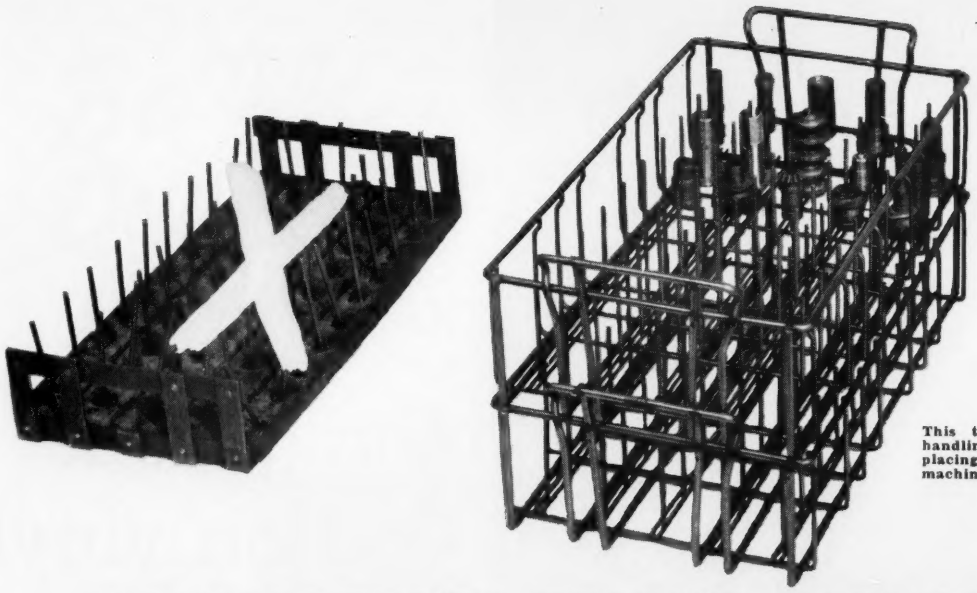
Don't let your wind-up problems throw you. Consult your Louis Allis field engineer--he has the drive and he also has engineering experience in applying these drives that can help you.



Write for latest information describing the Ajusto-Spede® and other adjustable speed drives manufactured by Louis Allis Co.

AS-102

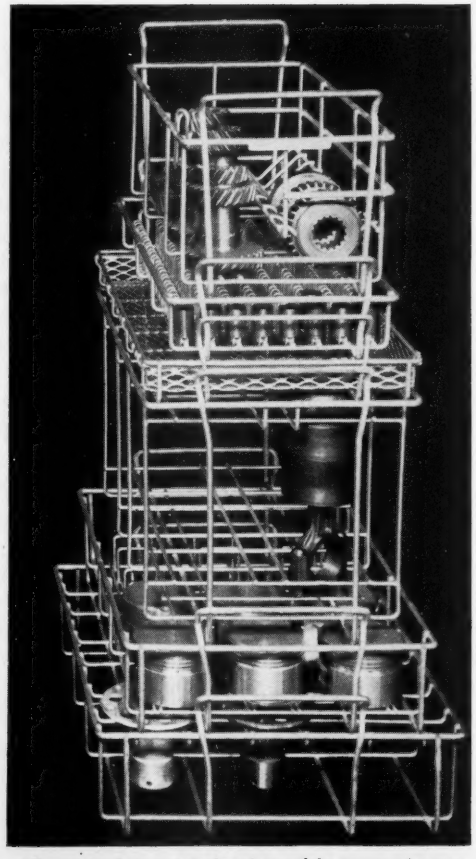
THE LOUIS ALLIS CO.
MILWAUKEE 7, WISCONSIN



This type all-wire materials handling baskets are fast replacing old style home-made machine parts carriers.

YOUNGSTOWN BRIGHT BASIC WIRE

now used to fabricate stronger, longer-lasting materials handling baskets



All-wire baskets are designed to safely transport many different type machine parts.

OLD-FASHIONED wooden trays and boxes used for handling expensive machine parts during production operations are on the way out. Today, industry is turning to modern all-wire baskets to safely perform this important function.

For fabricating their brand of all-wire carriers, Detroit's Mid-West Wire Products Company uses Youngstown Bright Basic Industrial Quality Wire. They find it forms easily—but gives the required stiffness and strength needed in the finished baskets. It spot-welds fast and sure for permanent, strong construction.

Youngstown Bright Basic Industrial Quality Wire is quality-controlled through all stages of production from ore mining to final drawing. This guarantees a wire free from both injurious seams and piping, laps, die marks, internal tearing and cupping. Why not make it your specification?

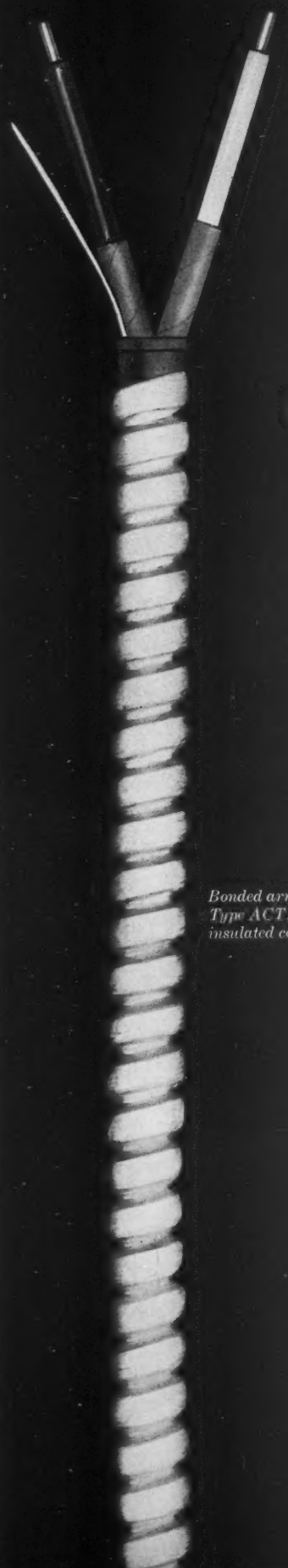
For further information or metallurgical assistance, write or phone today to your nearest Youngstown District Sales Office.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices - Youngstown 1, Ohio

District Sales Offices in Principal Cities



Bonded armored cable, Type ACT, with Opalon-insulated conductors.

Another Monsanto First!

Armored cable with Opalon* vinyl insulation gets U-L recognition!

Opalon improves wiring efficiency—and helps simplify installation!

A new and more efficient armored cable construction has just been perfected. And for the first time cable utilizing vinyl insulation has won recognition from Underwriters' Laboratories.

Builders and electrical contractors will be impressed with the outstanding physical and electrical properties of this cable's conductors which are insulated with Monsanto's Opalon compound.

This thermoplastic coating is so tough it reduces the possibility of shorting when wires are pushed over sharp edges in the junction box. Stripping is neater and easier because there is no fraying of the insulation. Color identification is permanent.

This trail-blazing development in wiring was pioneered by three of America's most progressive manufacturers—Columbia Cable & Electric Corp.; Clifton Conduit, Inc.; and Ettco Wire & Cable Corp.—working closely with Monsanto.

For data sheets and complete information on Opalon electrical compounds, write Monsanto Chemical Company, Plastics Division, Room 1125, Springfield 2, Mass.

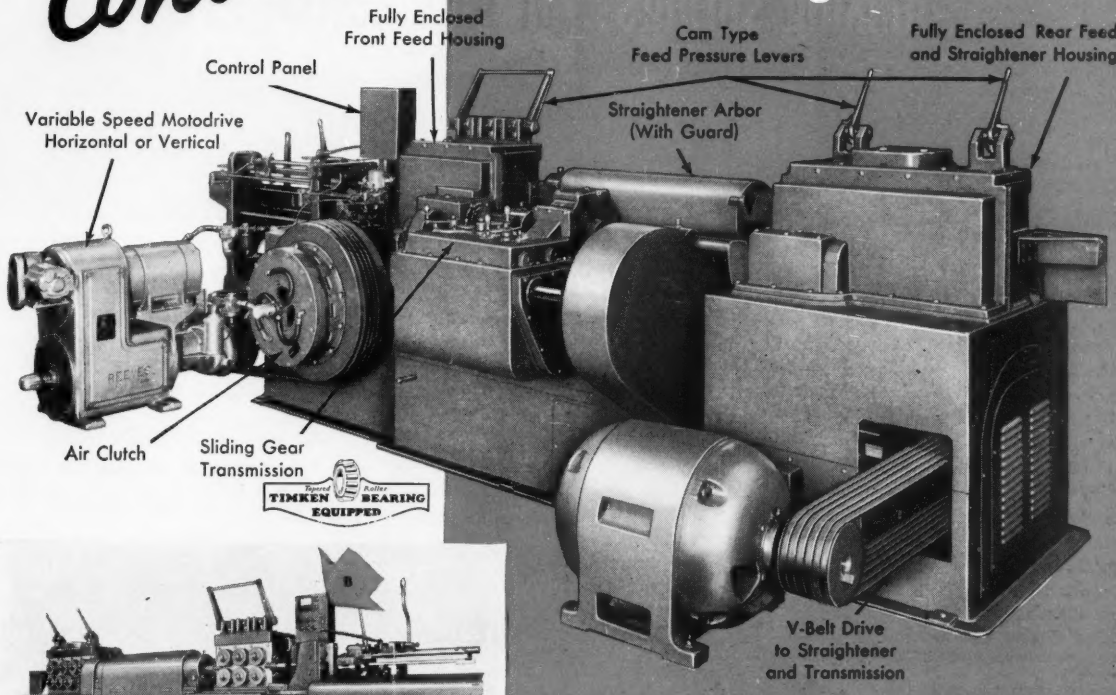
MONSANTO

*OPALON: REG. U. S. PAT. OFF.

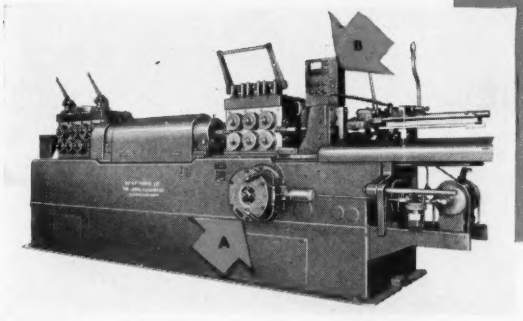
Better Quality Control ✳

LEWIS

introduces the Air Clutch on wire straightening and cutting machines


Fully Enclosed Front Feed Housing
Cam Type Feed Pressure Levers
Fully Enclosed Rear Feed and Straightener Housing
Control Panel
Straightener Arbor (With Guard)
Variable Speed Motodrive Horizontal or Vertical
Air Clutch
Sliding Gear Transmission
Tapered Roller TIMKEN BEARING EQUIPPED
V-Belt Drive to Straightener and Transmission

No. 11-F Travel-Cut with Flying-Shear Cut-off. Capacity ½" to ¾" diameter. 75-135 feet per minute. Rear view (above) with guards removed showing air clutch and drive.



Front view of No. 11-F Travel-Cut with Flying Shear Cut-off showing Air Brake "A" (with guard removed) and operating panel "B" with push-button controls for Air Clutch, Reeves Motodrive and flywheel speed Indicator Tachometer.

● Lewis engineers have added three important improvements to their famous Travel-Cut Machines for BETTER QUALITY CONTROL . . . These machines are already in service in America's leading steel and wire mills.

✳ Wichita Air Clutch permits higher cut-off speeds, eliminates shock of conventional clutch. No adjustment necessary . . . automatically compensates for wear.

✳ Wichita Air Brake eliminates conventional mechanical drag brake and is only engaged for a short portion of the cut-off cycle.

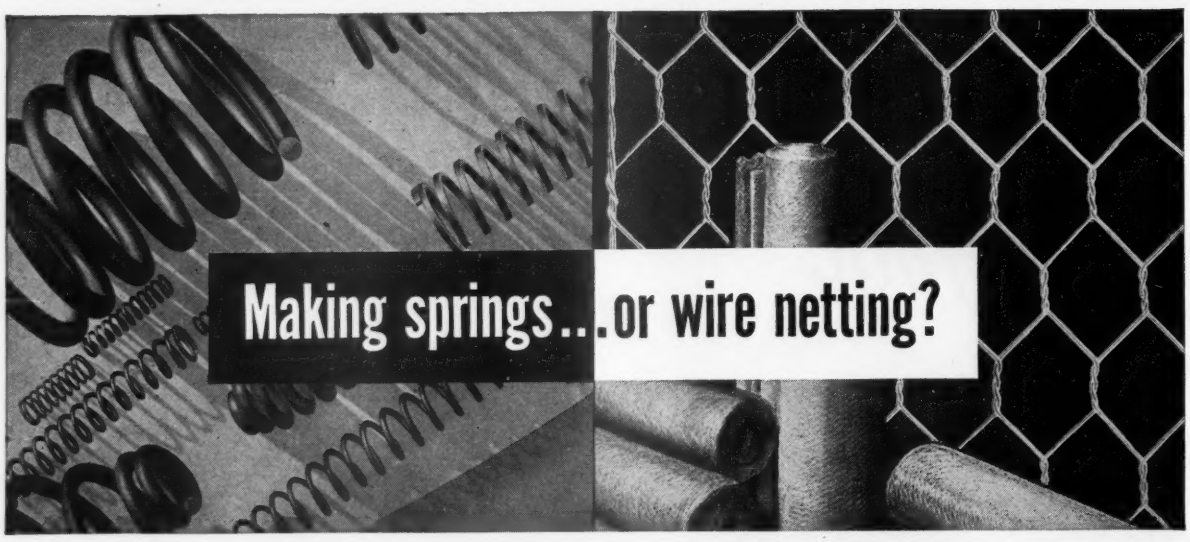
✳ Reeves Variable Speed Motodrive permits infinite adjustment of flywheel speed for perfect synchronization of the cut-off and wire feed speeds. This unique arrangement makes possible the cutting of rod WITHOUT SPOT SWELL . . . allows finer adjustment for cutting short lengths. Dial tachometer registers flywheel speed.

There are Standard Lewis Travel-Cut or Stationary-Cut Machines designed to straighten and cut all materials and shapes in wire or rod from .012" to ¾" at a wide range of feed speeds.

Air Clutch available on all Travel-Cut Models. Send for new brochure showing complete line of Lewis Wire Straightening and Cutting Machines.

LEWIS MACHINE COMPANY

3440 East 76th Street
Cleveland 27, Ohio



Use the 60 years' experience built into WAFIOS automatic machines

You can produce right and left-hand springs in cylindrical, single and double-cone shapes, both open and close-wound with WAFIOS UNIVERSAL AUTOMATIC SPRING COILING MACHINES. Specially shaped springs, springs with closed ends and torsion springs with shanks can also be manufactured on these machines.

They're compact, accurate, simple and economical machines to operate and easily adjusted; have 2-3 wire feed speeds; 18 to 30 steps for wire length adjustment. Automatic stopping of feed rollers during cutting off. Coiling dies, pitch tool and cutter mandrel can be adjusted during operation.

Type UFM50R handles wire sizes from #19 to #6 AS&WG—produces springs up to 3" outside diameter at rates of about 48, 68 and 88 per minute. Other UFM types for wire sizes from #40 AS&WG to ⅝".

Other Wafios Machines for spring manufacturers

Spring end grinders; simple spring coilers; machines for special tension springs; winders for cylindrical tension and compression springs, bowdencoils, spirals for electrical appliances, baby carriage springs, spirals for spring roller bearings, special section spirals, springs for clothes pegs; looping machines; lock washer machines; torsion spring winders.

Write for Catalog No. 201

WAFIOS
MASCHINENFABRIK
Wagner, Ficker & Schmid • Reutlingen 3, Wuerttemberg, Germany

All types of square mesh netting with both edges knuckled or with ends spiral twisted are made on this WAFIOS AUTOMATIC DOUBLE SPIRAL CHAIN LINK FENCING MACHINE. Width of mesh from ⅜" to 2". For wire sizes from 16½ to 9½ AS&WG.

Other sizes and types for automatic and semi-automatic manufacture of chain link fencing in a wide range of mesh widths and wire sizes.

WAFIOS MACHINES for Wire Netting and Wire Mesh Fabrics . . .

Complete equipment for the manufacture of hexagonal, straight line and triangular mesh wire netting.

Automatic machinery for the manufacture of barbed wire and staples.

Round mesh weaving machines for the manufacture of 1-, 2- and 3-ply round mesh weaving for mattresses and other applications. Manual, semi-automatic and automatic types. Also used for crossed and interwoven mesh for many other applications.

Wire crimping machines in manual and automatic types. **Assembling looms** for the manufacture of crimped mesh from crimped wire.

Write for Catalog No. S-100

Sole distributor for U.S.A.:

KURT ORBAN COMPANY, INC.
34 Exchange Place, Jersey City, N. J.

Sole agents for Australia and New Zealand:
Bliss & Reels Co. Pty. Ltd., 64-66 Little Bourke St., Melbourne C. 1, Australia

Test with the best!

ENTWISTLE WIRE SPARKERS...

PRICED FROM $350 TO $975

THE IDEAL EQUIPMENT FOR TESTING INSULATION ON WIRE OR CABLE

CLASS C

3,000–15,000 VOLTS

High speed, high sensitivity fault circuit.

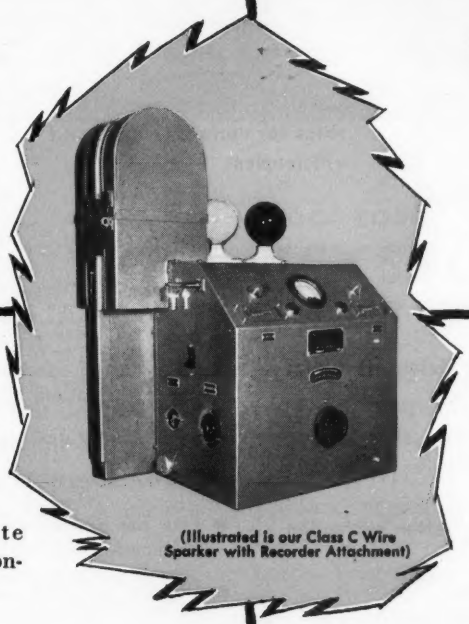
The standard of quality in spark testing now in use the world over.

CLASS K

500–15,000 VOLTS OR 3,000–15,000 VOLTS

High speed, high sensitivity fault circuit.

Designed to offer broader ranges in a floor model.



(Illustrated is our Class C Wire Sparker with Recorder Attachment)

CLASS V

5,000–15,000 VOLTS

Low speed, low sensitivity.

Developed to relocate already existing fault conditions for patching.

CLASS G

500–5,000 VOLTS

High speed, medium sensitivity.

Designed to meet the specifications for low voltage testing of thin wall or telephone cable conductors.

Our remodeled and expanded line of Wire Sparkers is another example of how Entwistle is setting the pace in the wire manufacturing industry. For Wire Sparkers . . . and all your wire machinery needs . . . see us first!

Visit our rooms in the William Penn Hotel during the Convention, October 29 — November 1.

ENTWISTLE MANUFACTURING CORPORATION

Plant and Executive Offices

1475 ELMWOOD AVE., PROVIDENCE 7, RHODE ISLAND

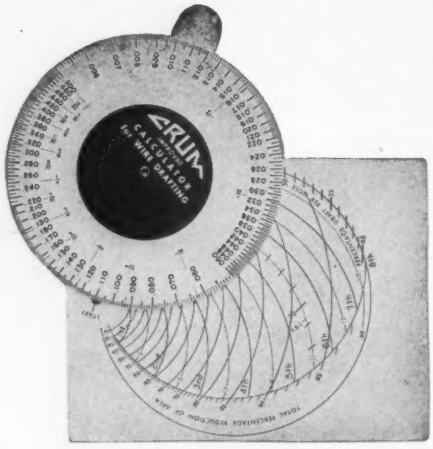
FORMERLY JAMES L. ENTWISTLE CO.

SAVE SET-UP TIME WITH THE . . .

CRUM CALCULATOR

FOR WIRE DRAFTING

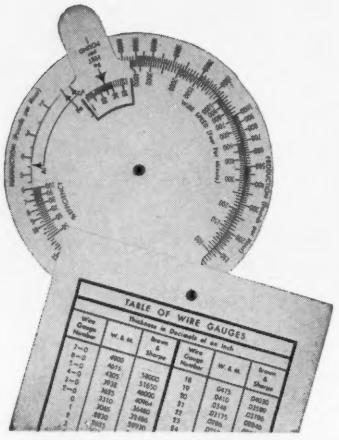
Useful and Accurate!



Front view of Crum Calculator.

THIS NEW DOUBLE-PURPOSE CALCULATOR WILL:

1. Provide quicker and more accurate information on die sizes and reduction areas;
2. Calculate wire production rates for various speeds and efficiencies.



Reverse view of Crum Calculator.

SOME OTHER FEATURES OF THE CALCULATOR

- Has new scale for more accurate determination of small percentages.
- Gives readings in B & S gauges.
- Intermediate lines provide reductions for 16 holes in one setting.
- New rectangular shaped back for better protection of calculator.
- More legible % draft-per-hole scale.
- Vinyl plastic construction, resistant to wear, warping, dirt, perspiration, wire drawing soaps—can be cleaned.
- Still fits your vest pocket.
- Handy tables of W & M and B & S gauges.
- Feet per pound calculating scale for steel, copper and aluminum wires.
- Durable, accurate, easy to use.

The improved Crum Calculator is worth its weight in gold in time saving —no laborious mathematical calculations necessary when you use it. Instruction sheet with examples accompany each Calculator. You should have one or more in your wire drawing department.

THE PRICE: $5.00 EACH

Send your orders to:

WIRE AND WIRE PRODUCTS

453 MAIN STREET **STAMFORD, CONN.**

(Exclusive distributors)

Chicago Rivet & MACHINE CO.

lower tool costs . . . get quality rivets with KEYSTONE WIRE

Tubular rivet manufacture by the cold heading extrusion process is one of the most difficult cold forming operations. The combination of a hollow punch operation plus an extreme upset makes it difficult to hold a uniform outer shell. A smooth finished appearance is necessary because rivets many times are visible in the finished products.

Chicago Rivet & Machine Co., Chicago, Illinois, has frequently consulted with Keystone Metallurgists when difficult forming problems confronted them. As a result, the right Keystone Tubular Rivet Wire has been successfully applied in the manufacture of the many intricate rivets produced by this company. They report increased die life and a higher quality finished product.

The fine *flowability* characteristics of Keystone Tubular Rivet Wire lower costs, reduce rejects and produce precision fasteners more efficiently. A Keystone Wire Specialist will gladly analyze your needs. Your inquiry is invited!

Keystone Steel & Wire Company, Peoria 7, Illinois

KEYSTONE
WIRE FOR INDUSTRY

KEYSTONE STEEL & WIRE COMPANY
Peoria 7, Illinois

Mail coupon for free booklet—
COLD HEADING FACTS! Discusses methods, technical facts, wire requirements and other data.

Name_____ Title_____

Company_____

Street_____

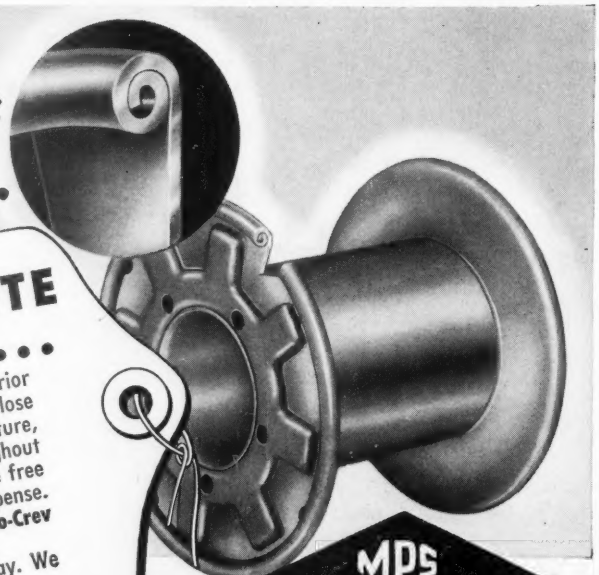
City_____ State_____

Welcome

TO MEMBERS AND GUESTS
ATTENDING THE
1956 WIRE CONVENTION

YOU TOO SHOULD USE
SUPERIOR MPS SPOOLS AND REELS
WITH THE EXCLUSIVE HEAVY DUTY
CONVOLUTE DURA CURL RIMS

The Difference
IS HERE.....



NEW MPS CONVOLUTE
DURA CURL RIMS...

The difference between just any spool or reel and Superior MPS CONVOLUTE DURA CURL Rims is well worth your close attention. Because now, with this exclusive MPS feature, maximum strength and rigidity are obtained throughout the reel heads. You can now have continuous trouble free high speed winding, without spool straightening expense. These new MPS spools also have the famous **No-Crev** feature.
Ask about MPS CONVOLUTE DURA CURL RIMS today. We invite your inquiries.

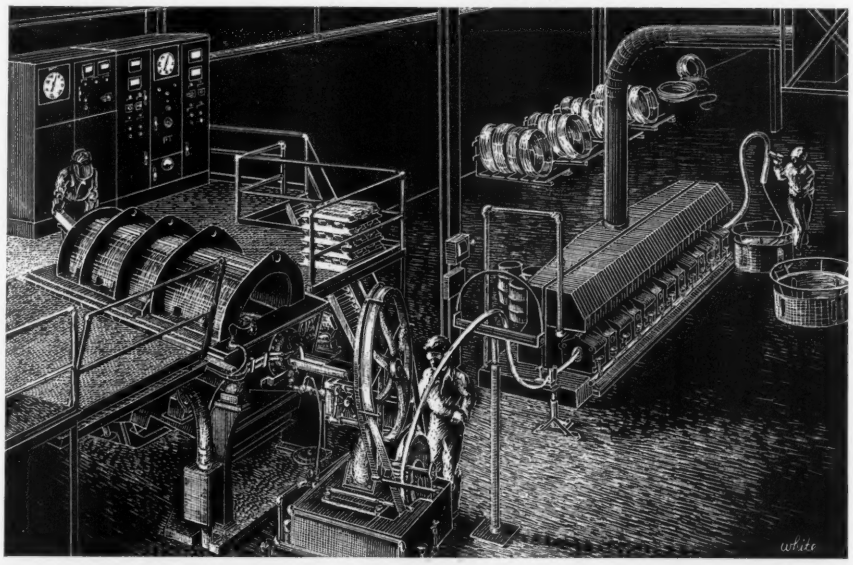
MPS
CONVOLUTE
Dura Curl
Spools & Reels
give you brute strength with dimensional precision, concentricity, and balance. Another patented MPS development engineered to **help you!**

18 West St., Attleboro,
Massachusetts, U.S.A.
Telephone Attleboro 1-0848

Mossberg PRESSED STEEL Corporation

#110

From Molten Aluminum to 3/8" Diameter Rod in 1½ Minutes!



Rome Cable Corporation

uses AJAX INDUCTION FURNACES for

MELTING ALUMINUM FOR CONTINUOUS CASTING AND ROLLING OF HIGH CONDUCTIVITY ROD

The picture above, a drawing made at the Rome Cable Corporation, Rome, N. Y., shows one of the most modern installations in the country for the continuous casting and rolling of aluminum rod directly from molten metal. From left to right are shown the electric controls of the adjacent 450 kW. AJAX low frequency induction combined melting and holding furnace which is pouring molten metal into the Properzi continuous casting machine in the foreground, and the rolling mill from which the coiled rod is emerging.

This installation casts at the rate of about one ton per hour. The furnace feeds a continuous stream of molten aluminum at automatically controlled temperature into a rim cavity on the slowly revolving wheel of the Properzi machine. Metal loss from pig to rod averages less than 1 pct. Mechanical properties and electrical conductivity are excellent; the material is sound and fine grained. The men work under cooler, cleaner conditions because the only heat generated is within the melt itself. Due to melting conditions inherent in AJAX furnaces, the operation is continuous and no flexing is required.

AJAX TAMA-WYATT

AJAX ENGINEERING CORP., TRENTON 7, N. J.

INDUCTION MELTING FURNACE

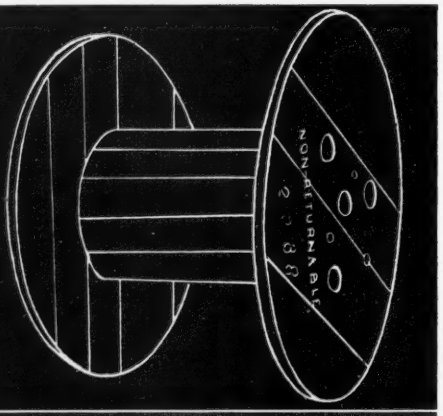
AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., The Ajax-Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax-Wyatt Induction Furnaces for Melting

Three TO MAKE MONEY

the NARCO NON-RETURNABLE

- AN EXPENDABLE PACKAGE
- LIGHT IN WEIGHT

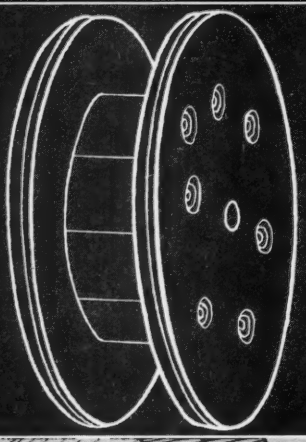
LOW IN COST
NO MAINTENANCE



the NARCO METAL BOUND

- THE QUALITY REEL THAT **LASTS** AND **LASTS** AND **LASTS**
- **FOUR** TO **SIX** TIMES THE LIFE OF ALL WOOD REELS

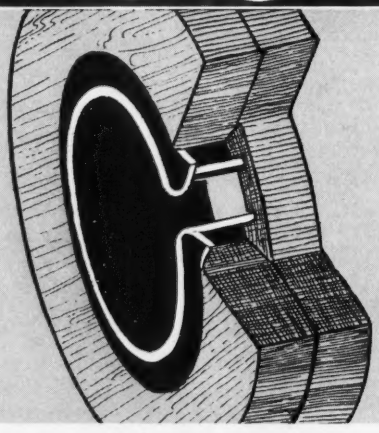
NO MAINTENANCE



the NARCO SPLIT BUSHING

- REPLACES COSTLY HUB PLATES AND CASTINGS

LOW IN COST
NO MAINTENANCE

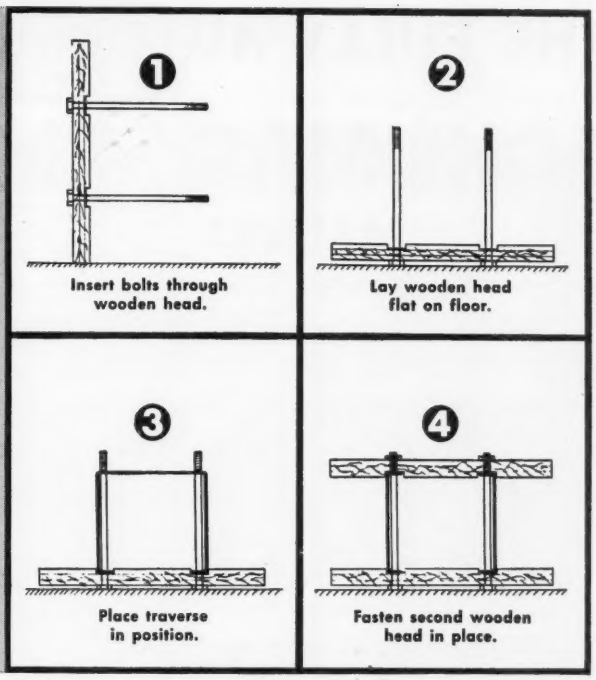


Remember These are products of the most modern up-to-date reel plant in the world. Manufactured by a company with nearly 50 years experience and a background of exhaustive testing and research in the laboratory and the field.

• • • • MAKERS OF REELS SINCE 1909 • • • •

Simple 4-Step Reel Assembly with REPUBLIC FLANGED STEEL TRAVERSES

SAVES
TIME • LABOR • MONEY



Republic Flanged Steel Traverses save time . . . because they require only four simple steps in reel assembly. They save labor . . . no special tools are necessary. They may be stacked and stored in a minimum amount of room . . . thus saving space. And they save money by providing long service life. Actual experience records show that Republic Flanged Steel Traverses have given as much as sixteen years' service—without refinishing or major maintenance. In many cases, their use has doubled the number of trips per reel before cut-downs or scrapping of wooden heads.

Republic "Reinforced Type" Steel Traverses have extra strength where it is needed most—at bolt holes and base of flange. Reinforcing makes possible the use of lighter gage steel, saving up to 20% in weight while increasing over-all strength.

Sizes of Republic Flanged Steel Traverses range up to 56″ diameter and 48″ traverse. Finishes include plain, painted and hot dip galvanized. Width of flange and number of bolt and drain holes can be furnished to your specifications. Send coupon for more information.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
Pressed Steel Division
6102 Truscon Avenue • Cleveland 27, Ohio

☐ Please send more information on Flanged Steel Traverses

Name _____ Title _____

Company _____

Address _____

City _____ Zone ____ State _____

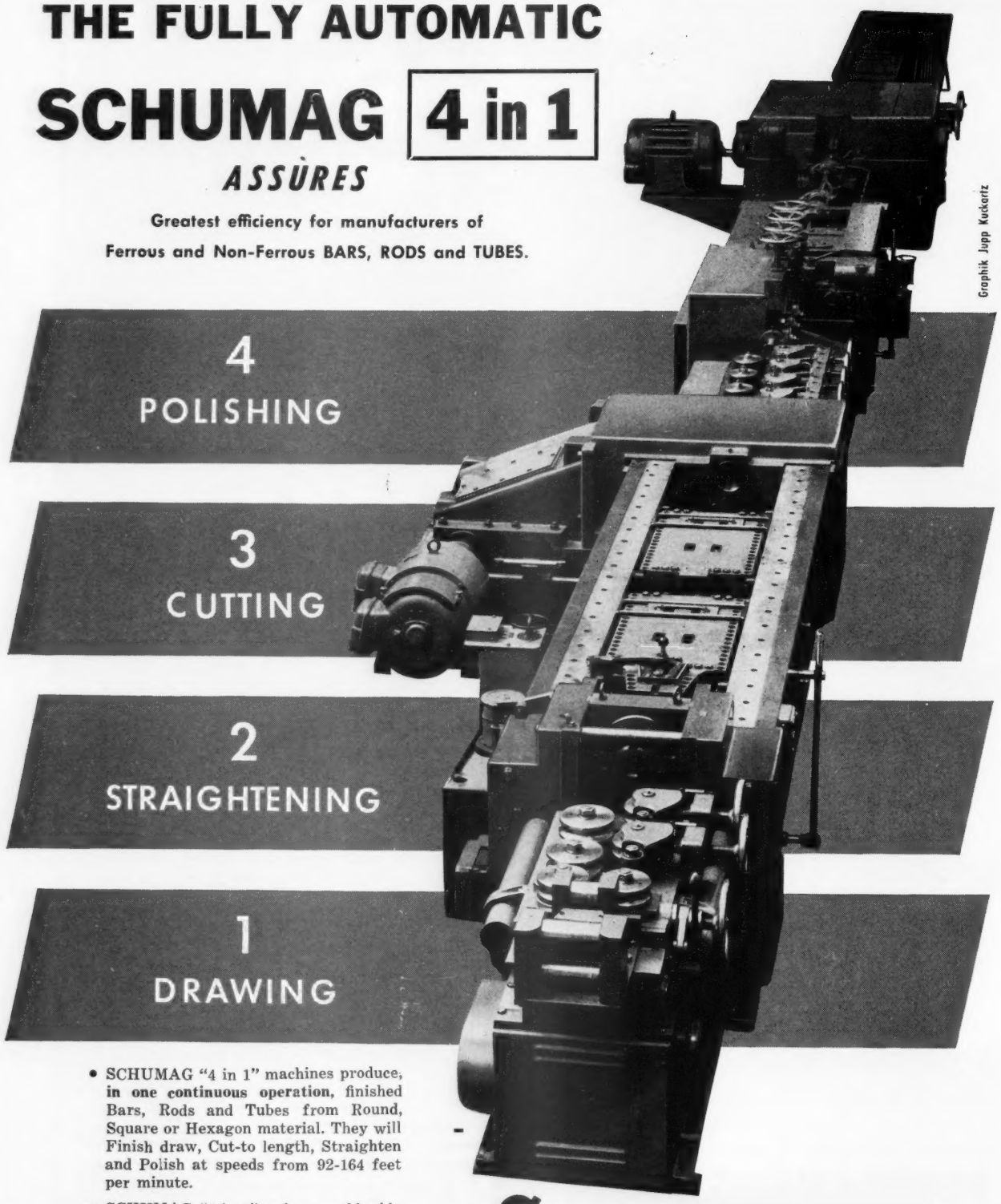
C-2550

THE FULLY AUTOMATIC

SCHUMAG 4 in 1

ASSURES

Greatest efficiency for manufacturers of
Ferrous and Non-Ferrous BARS, RODS and TUBES.



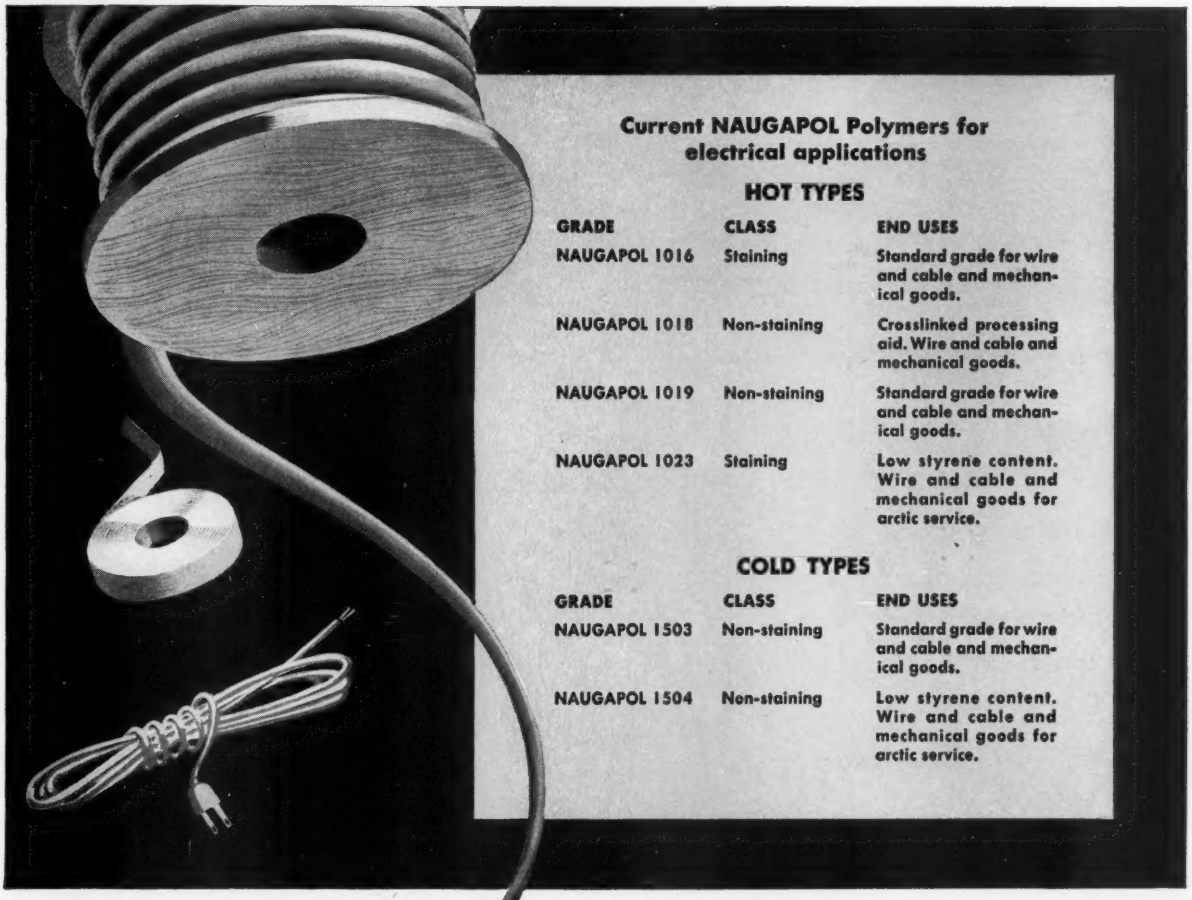
Graphik Jupp Kuckertz

- SCHUMAG "4 in 1" machines produce, **in one continuous operation,** finished Bars, Rods and Tubes from Round, Square or Hexagon material. They will Finish draw, Cut-to length, Straighten and Polish at speeds from 92-164 feet per minute.
- SCHUMAG "4 in 1" enjoys world-wide reputation as the **ultimate** in technical development.

SCHUMAG AACHEN

Exclusive Representatives for USA, Canada & Mexico
AMERICAN LAUBSCHER CORPORATION Fisk Bldg., 250 West 57th Street, New York 19, N. Y.

Naugatuck Naugapol



Current NAUGAPOL Polymers for electrical applications

HOT TYPES

GRADE	CLASS	END USES
NAUGAPOL 1016	Staining	Standard grade for wire and cable and mechanical goods.
NAUGAPOL 1018	Non-staining	Crosslinked processing aid. Wire and cable and mechanical goods.
NAUGAPOL 1019	Non-staining	Standard grade for wire and cable and mechanical goods.
NAUGAPOL 1023	Staining	Low styrene content. Wire and cable and mechanical goods for arctic service.

COLD TYPES

GRADE	CLASS	END USES
NAUGAPOL 1503	Non-staining	Standard grade for wire and cable and mechanical goods.
NAUGAPOL 1504	Non-staining	Low styrene content. Wire and cable and mechanical goods for arctic service.

Naugatuck answers wire and cable insulating problems with..Naugapol

For products requiring excellent electrical properties and for those items designed for low moisture absorption, NAUGAPOL, butadiene-styrene copolymers, "Specially Processed" during the finishing operation, is the best obtainable.

For technical data, information or assistance that will help you in processing of your rubber compounds, write to us on your company letterhead.

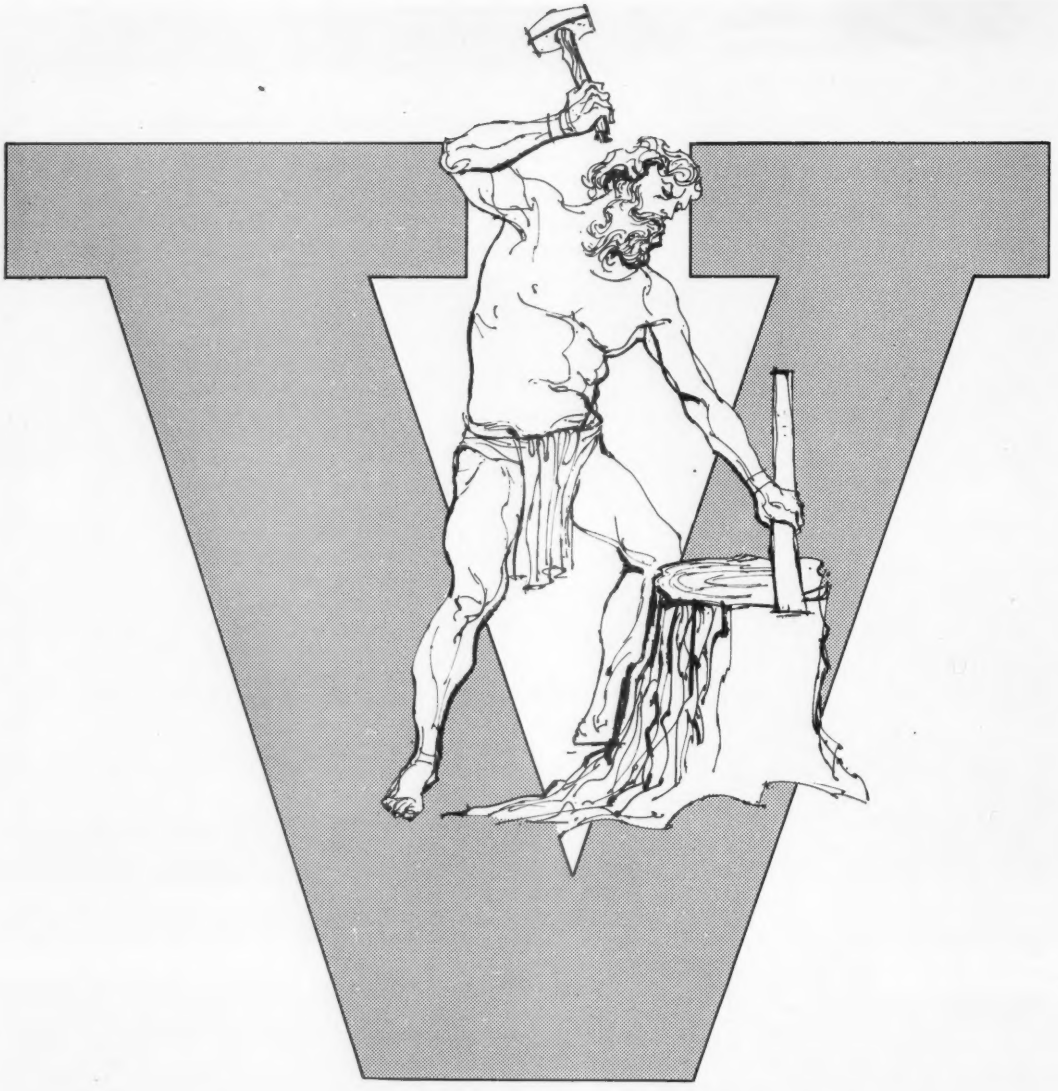
Naugatuck's trade name for its specially-processed butadiene-styrene copolymers.

Naugatuck Chemical

Division of United States Rubber Company
Naugatuck, Connecticut

US RUBBER

IN CANADA: NAUGATUCK CHEMICALS DIVISION • Dominion Rubber Company, Limited, Elmira, Ontario • RUBBER CHEMICALS • SYNTHETIC RUBBER • PLASTICS • AGRICULTURAL CHEMICALS • RECLAIMED RUBBER • LATICES • Cable Address: Rubexport, N.Y.



This Symbol signifies your quality source for brass, copper, bronze, and nickel silver wire, rod and strip . . . delivered promptly and to your precise specifications. We would be pleased to have our technical services department help you in choosing the right metal for your specific requirements.

THE SUPPLIER THAT IS NOT YOUR COMPETITOR

VOLCO *Brass and Copper Co.*

MILLS AND SALES OFFICE: Kenilworth, N.J.
New York phone: WOrth 2-7500

Branches: CHICAGO • PHILADELPHIA • CLEVELAND • PROVIDENCE • HARTFORD

© 1956 Volco Brass and Copper Co.

Serc DIAMACONTROL *leads the way*

AUTOMATION

in diameter control of cable has at last come into the realms of possibility. SERC's drift free unit has proven so stable (less than 0.0001" drift over one month's constant operation) and so accurate that one manufacturer has decided it will do for a *completely automatic* set up with *over* 40 extruders.

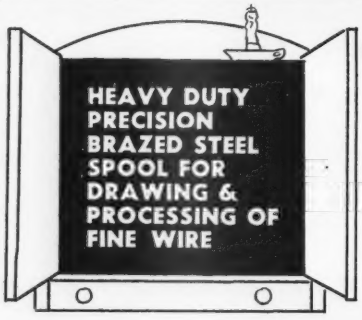
If DIAMA-CONTROL is good enough for automation, can you afford to do without it?

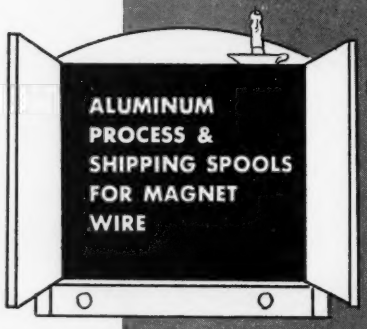
Want further information? Write:

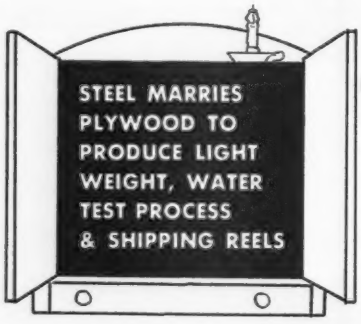
STANDARD ELECTRONICS RESEARCH CORP.
2 EAST END AVE • NEW YORK 21, N.Y.
Telephone - RHinelander 4-4100

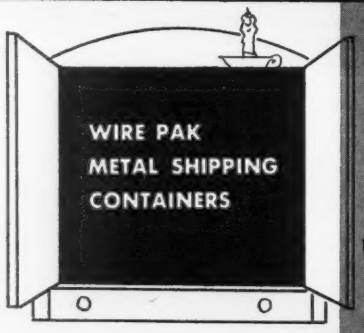
NEW DEVELOPMENTS BY HUBBARD

FOR THE WIRE & CABLE INDUSTRY









PLUS

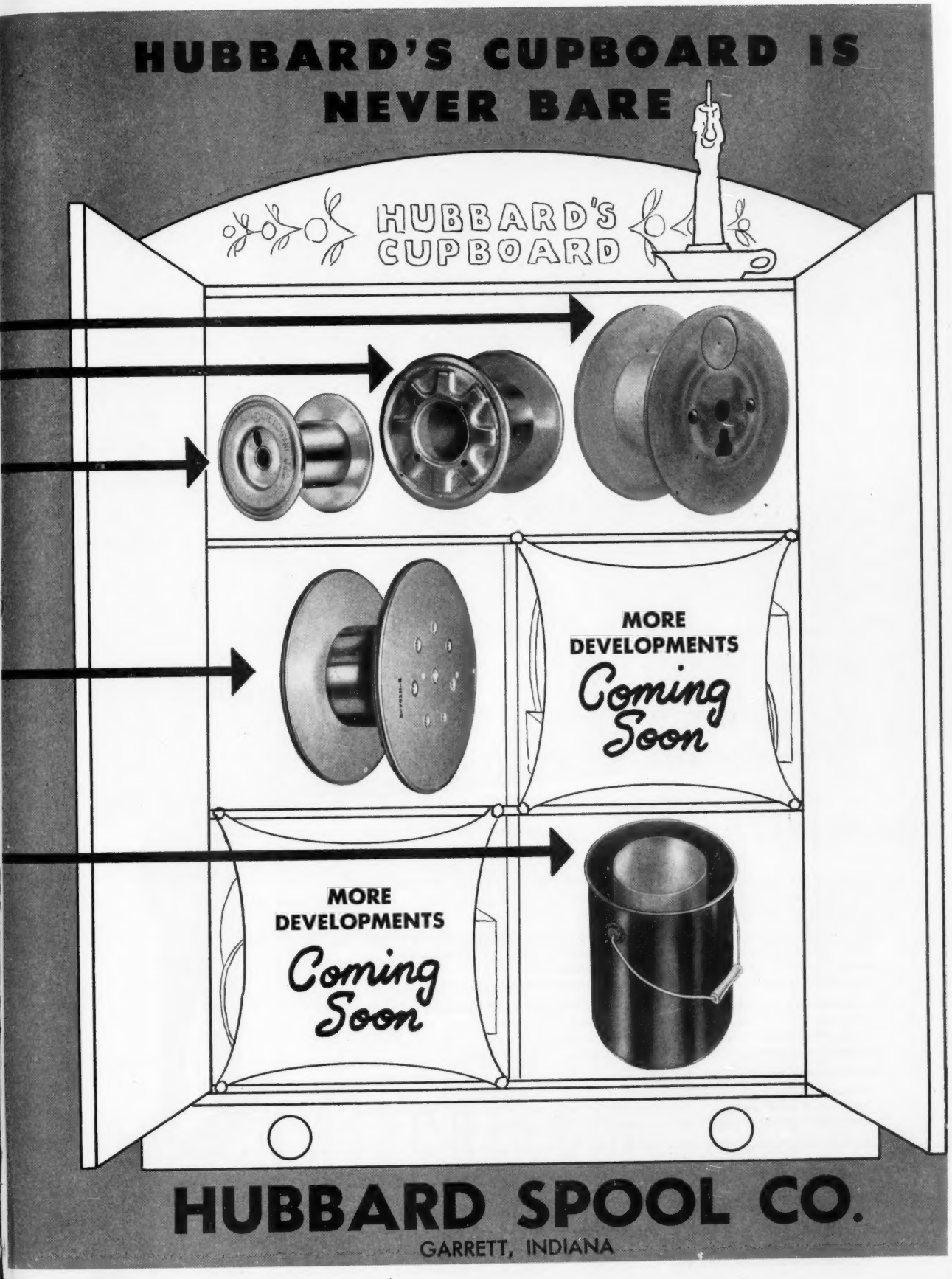
- STEEL TRAVERSES FOR CABLE REELS
- VARIOUS TYPES OF NON-RETURNABLE SHIPPING REELS
- STEEL PROCESS SPOOLS FOR FINE WIRE
- DOUBLE HEAD RETURNABLE SHIPPING SPOOLS FOR MAGNET WIRE
- CUSTOM DESIGNED SPOOLS FOR SPECIAL USE

FOR DETAILS CONTACT

HUBBARD SPOOL CO.

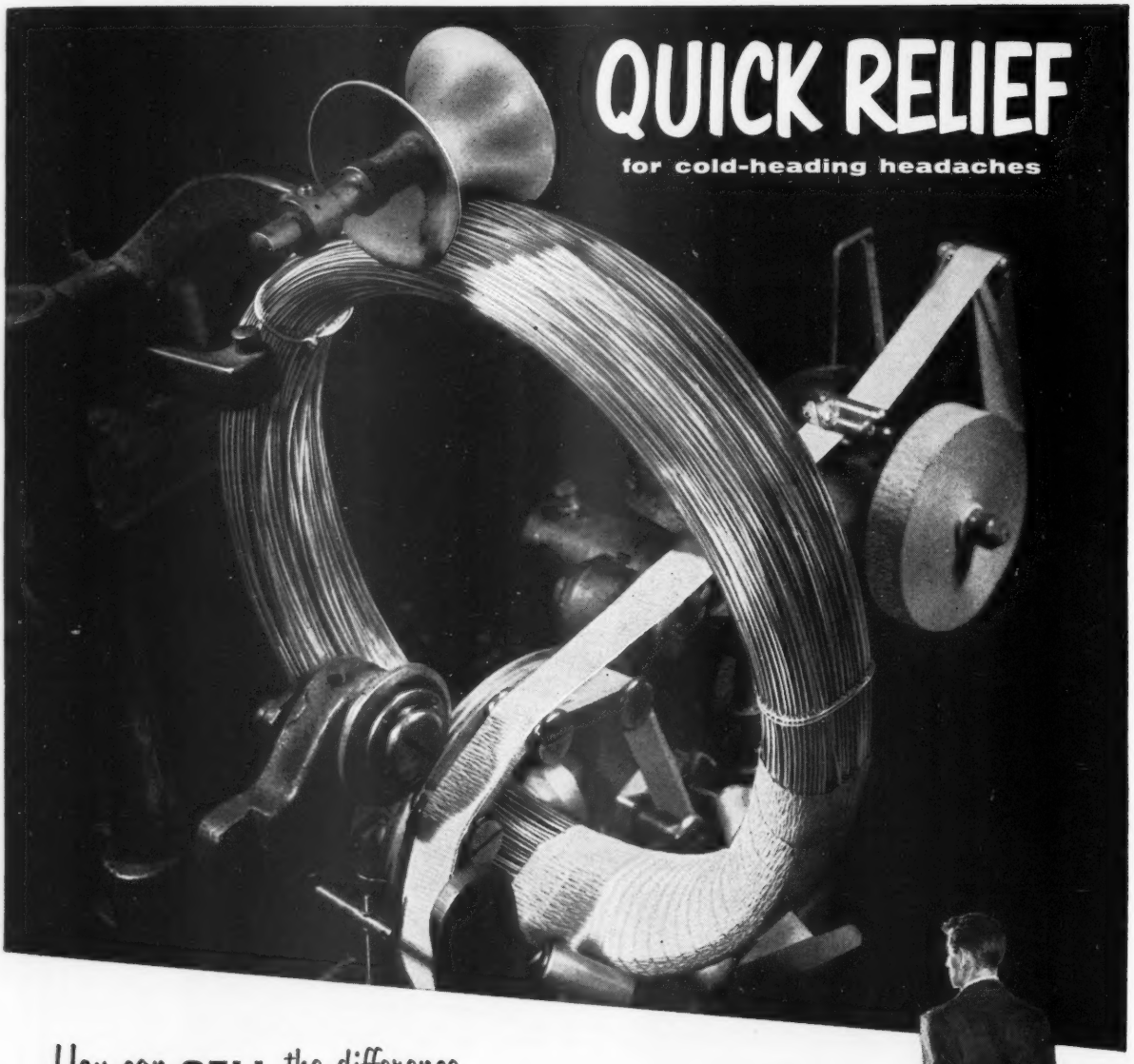
GARRETT, INDIANA

HUBBARD'S CUPBOARD IS NEVER BARE



HUBBARD SPOOL CO.

GARRETT, INDIANA



You can **SELL** *the difference*

Scovill EXTRUDED COLD-HEADING WIRE (Cartridge Brass, 70%) is the prescription . . . and any number of well satisfied customers bear witness to its efficacy.

Produced by the hot extrusion process from Continuous-Cast billets, this high-copper-content wire is different in important respects . . . exceptionally uniform in alloy composition as well as physical properties . . . exceptionally free from metal defects.

Use of this superior wire virtually eliminates cold-heading defects (when attributable to wire), such as split heads or shanks . . . "out of round" heads . . . inadequate filling out of heads and shoulders . . . rough "orange peel" effect.

Prove this on your next wire order. Let us help you specify the proper closely controlled Scovill temper to produce more nearly perfect headed brass parts . . . whether you require "flow" characteristics for heading, or "flow" plus essential rigidity for secondary machining.

Scovill Manufacturing Company, Mill Products Division, 99 Mill St., Waterbury 20, Conn. Phone Plaza 4-1171.

SCOVILL **MILL PRODUCTS**
BRASS • BRONZE • NICKEL SILVER • ALUMINUM

65C56

Textilene Glascor® Fillers

(FIBERGLAS CENTERED)

OFFER GREATER TENSILE STRENGTH WITHOUT CHANGE IN BULK

Textilene® Glascor Fillers—for all types of wire and wire cables—are made with a Fiberglas center for greater tensile strength. They have better stripping action, greater flexibility, unusual uniformity—at lower cost. Another feature is high resistance to dry rot, mildew and fungus attack.

Talk to Twitchell people about your filler requirements. They'll be glad to give you technical assistance. No obligation.

E. W. TWITCHELL INC.

Third and Somerset Streets

PHILADELPHIA 33, PA.

Paper Products for the Wire Industry

TWISTED · FOLDED · PRESSED · CRUSHED · SHAPED · BRAIDED · WOVEN

WATERBURY FARREL
FOUNDED 1851

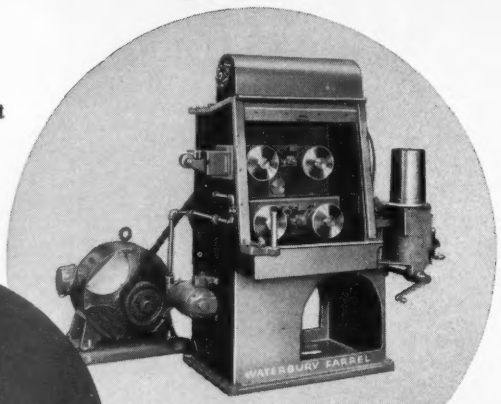
Custom-Engineered Upright Cone *Wire Drawing Machines*

★ In 4 Sizes

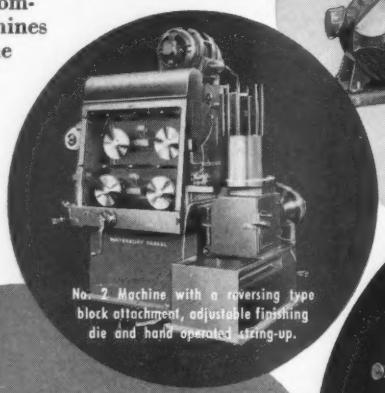
★ With Drive, String-Up and Packaging Equipment To Fit *Your* Specific Requirements

★ And Precision, Quality Construction Throughout

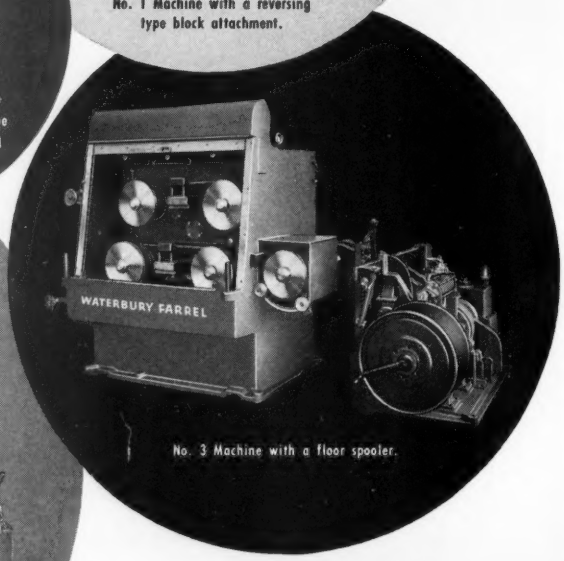
Here are four examples of Waterbury Farrel's long-proven ability to custom-engineer wire drawing machines for specific applications. The machine *you* need may call for another variation in design. For further information on the size and type of upright cone machine fitted to *your* exact requirements, contact Waterbury Farrel, today.



No. 1 Machine with a reversing type block attachment.



No. 2 Machine with a reversing type block attachment, adjustable finishing die and hand operated string-up.



No. 3 Machine with a floor spooler.

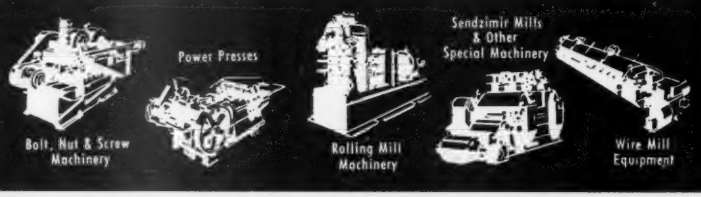
No. 4 Machine equipped with a cradle type floor spooler.

SPECIFICATIONS

Size of Machine	No. 1	No. 2	No. 3	No. 4
Max. No. of Dies	16	14	12	13
Max. Starting Size B & S	#14	#8	#4	¼
Finishing Sizes, B & S	#26 to #42	#20 to #34	#14 to #26	#12 to #18

WF-26

WATERBURY FARREL
FOUNDRY & MACHINE CO.
Waterbury, Conn. U. S. A.
Sales Offices: Chicago • Cleveland • Millburn, N. J.



Designing a new wire product?

Call American Steel & Wire!

Steel wire comes in so many different grades, shapes and finishes that it isn't easy to keep them all at your fingertips.

For this reason, we suggest that you give your American Steel & Wire representative a chance to help with new designs while they are still on the drawing board. He may be able to suggest 1) a more economical wire, 2) a wire that will fabricate more easily or 3) a slight design change that will simplify production or lower the cost of the raw material.

At AS&W, we *use* a lot of wire in our own plants; and have learned many little tricks that are yours for the asking. Just call your American Steel & Wire representative.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS AMERICAN MANUFACTURERS WIRE

USS TRADE MARK

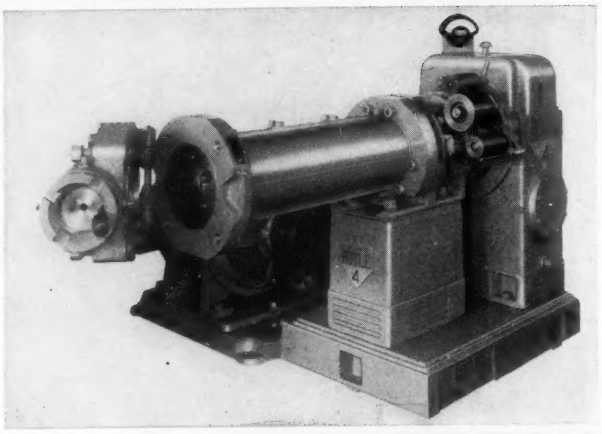
AMERFINE—*high quality fine wire.*
AMERSPRING—*music steel spring wire.*
AMERTEMP—*heavy-duty oil-tempered wire.*
AMERLOY—*alloy heading wire.*
AMERHEAD—*uniform heading wire.*
AMERSTITCH—*extra-tough metal stitching wire.*

UNITED STATES STEEL

ROYLE

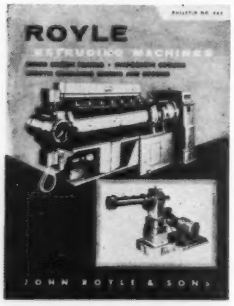
the oldest name in Extrusion Practices . . .

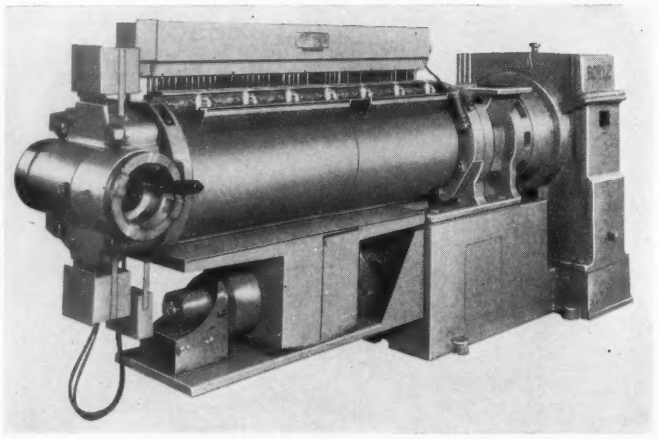
has designed **Royle** **Spirod** and **Spiroyle** extruding machines to meet the demands of modern processing requirements. These extruders are the result of over three-quarters of a century of experience in extruder design. **Spirod** with electric heating and high velocity evaporative cooling is designed for processing compounds that require higher and accurately zoned operating temperatures. However, it is an all-purpose extruder for either rubber or plastic compounds. **Spiroyle** is designed for processing compounds where the use of a circulating medium for sensitive operating temperatures is desired.



No. 4 (6") Spiroyle

Send for Bulletin No. 463





No. 5 (8½") Spirod for Jacketing

JOHN ROYLE & SONS — ROYLE — PATERSON N. J.

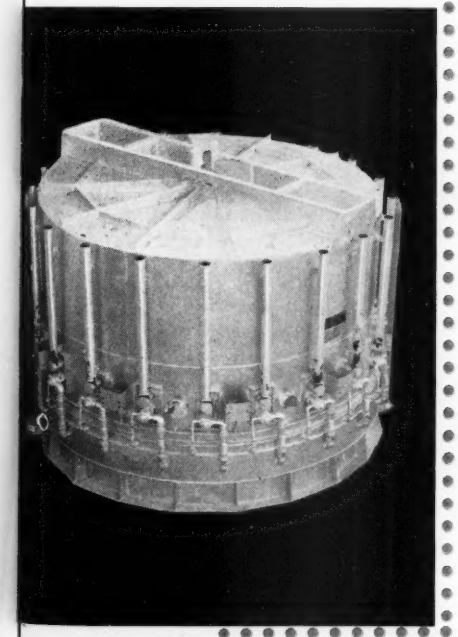
PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN 1880

London, England	Home Office	Akron, Ohio	Los Angeles, Cal.	Tokyo, Japan
James Day (Machinery) Ltd.	V. M. Hovey J. W. VanRiper	J. C. Clinefelter	H. M. Royal, Inc.	Okura Trading Co., Ltd.
Hyde Park 2430 - 0456	SHerwood 2-8262	BLackstone 3-9222	LUdlow 9-3261	(56) 2130 - 2149

There's only one way

to improve quality... increase yield... lower costs...

that's wire annealing with Lee Wilson HIGH Convection Furnaces

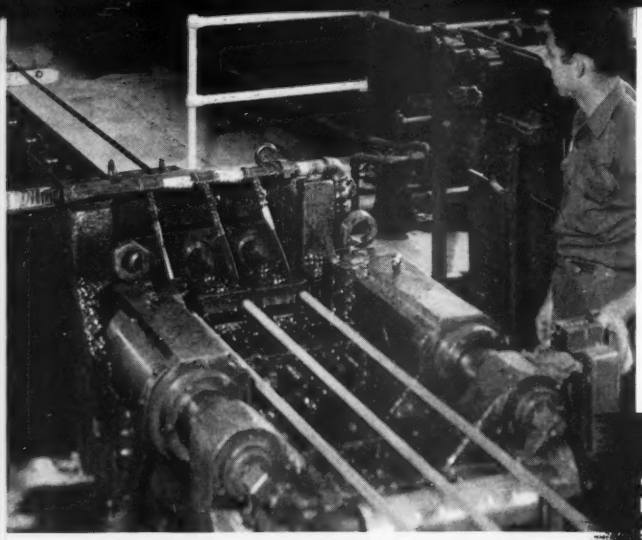


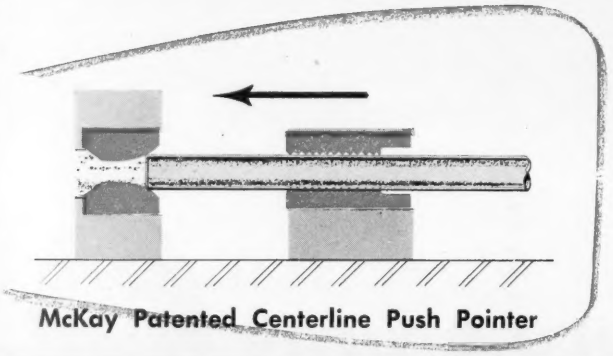
Fuel inputs are approximately doubled! Fan drives now are powered from 7½ h.p. to 25 h.p.! O-tubes have decreased fuel consumption!

These features can be applied to existing equipment as well as new projects. Ask for an engineering analysis of your wire annealing problems!

Lee Wilson* ENGINEERING COMPANY, INC.
20005 WEST LAKE ROAD • CLEVELAND 16, OHIO

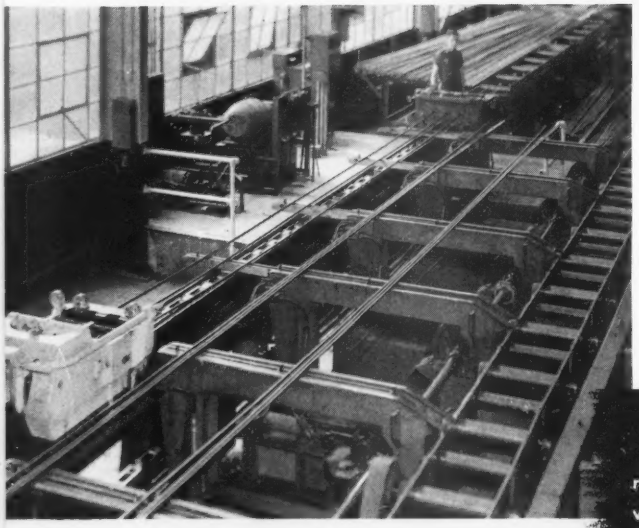
HIGH CONVECTION ANNEALING FURNACES
MAKE THE BEST METALS BETTER

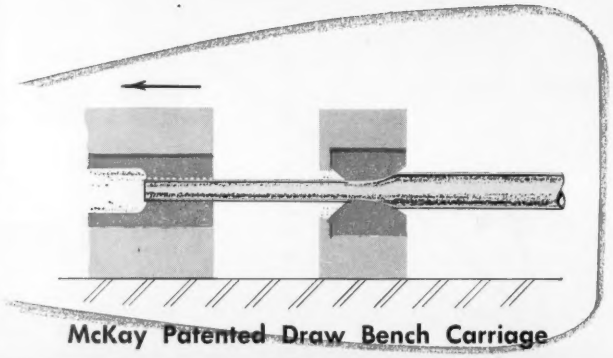




McKay Patented Centerline Push Pointer

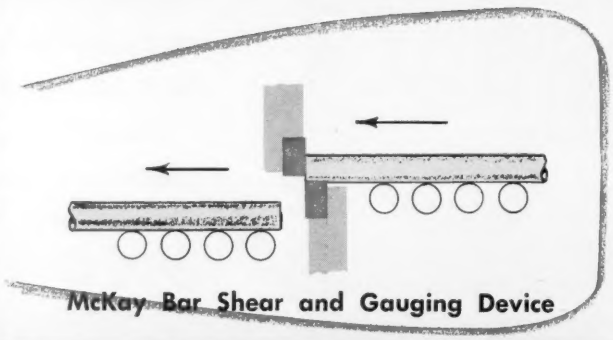
Automatic push pointing is the first operation in an automated draw line. The grips in the hydraulic push pointer engage the bars and push them through the dies so that the ends protrude a sufficient amount to accommodate the grips in the draw bench carriage. The pusher grips then automatically disengage and return to normal rest position while the bars are being drawn (as shown above).





McKay Patented Draw Bench Carriage

Positive, automatic, mechanical gripping combined with smooth, rapid acceleration of the carriage to maximum draw speeds along with automatic grip release and special high-speed carriage return drive insures perfect draws and continuous trouble-free production.



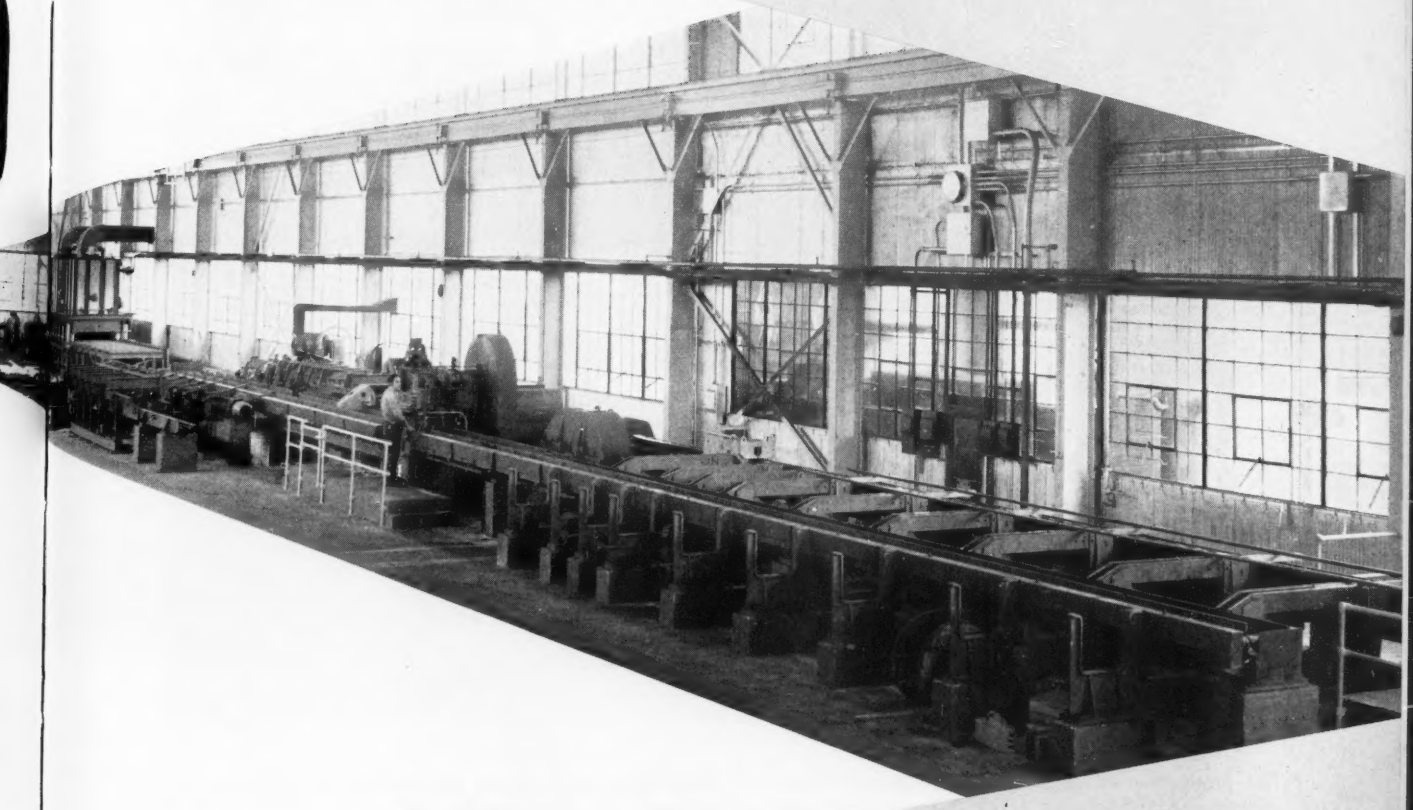
McKay Bar Shear and Gauging Device

A bar shear of rugged construction, incorporating a crop shearing device for multiple cuts and an automatic gauging table with driven conveyor rolls, accommodates maximum production schedules.

Round bars are automatically fed into a rotary straightener in continuous operation. Shapes are conveyed to shape straighteners where they are entered manually.

McKAY

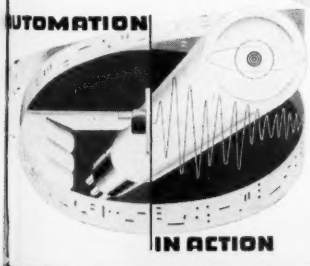
means SPEED and EFFICIENCY in COLD DRAWING



1. McKay Automated Lines boost production...

2. ...eliminate intermediate handling...

3. ...give uniform production.



The McKAY MACHINE Company
YOUNGSTOWN, OHIO

McK

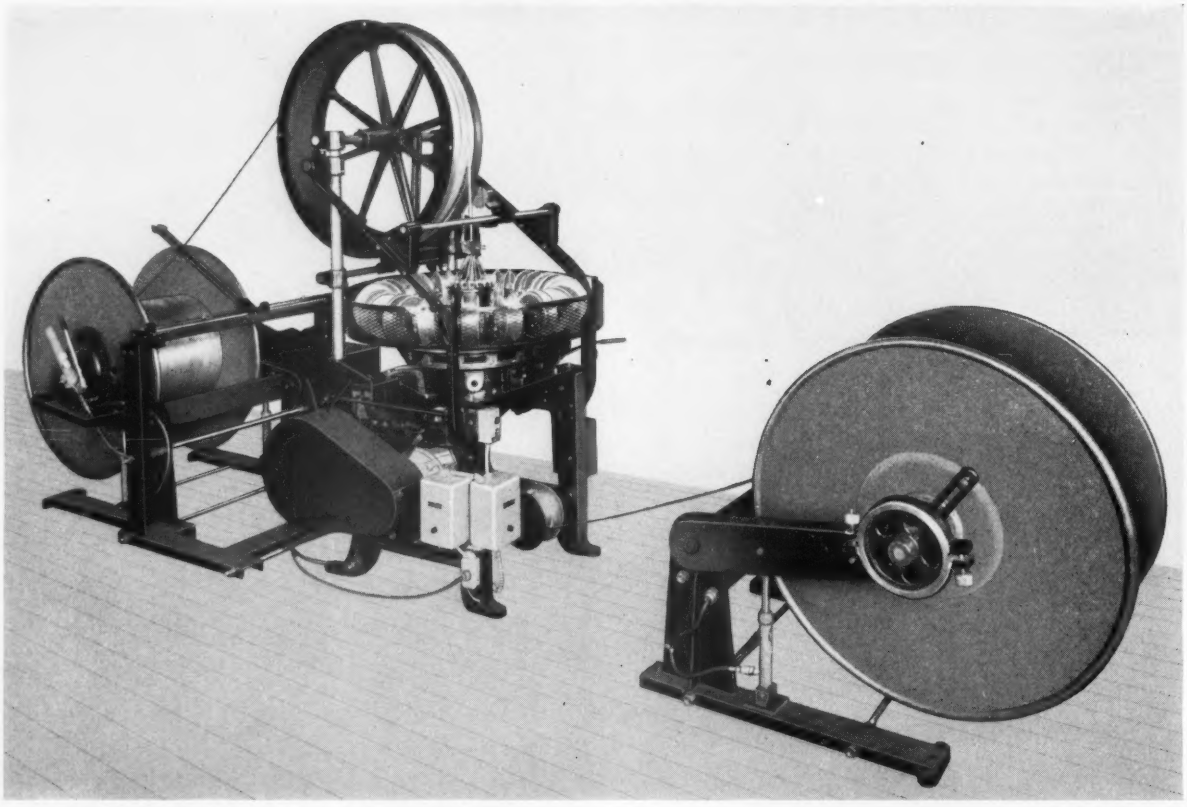
ENGINEERS AND DESIGNERS OF
EQUIPMENT FOR THE AUTOMOTIVE,
FABRICATING AND STEEL INDUSTR

New Improved WARDWELLIAN®

ARMOR WIRE SERVER

TYPE M-E

Applies multiple ends of wire to electrical conductors — for underground distribution cable and other applications



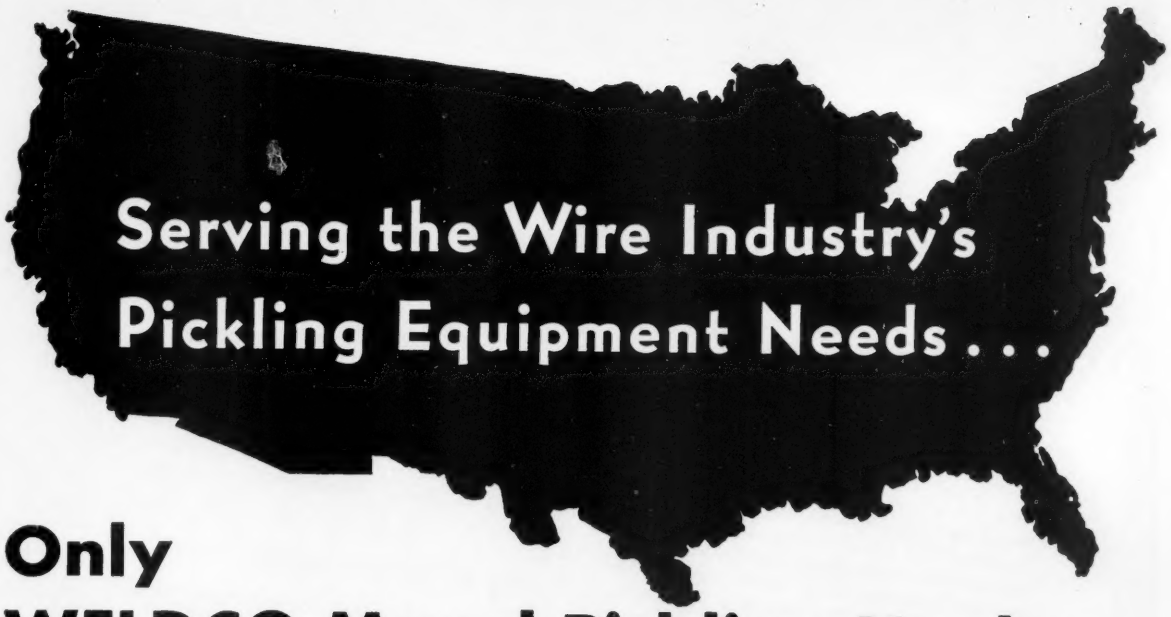
- For production of underground distribution cable: eighteen ends of flat wire, .009 x .047, can be applied at the rate of 250 inches per minute.
- Equipped with individual tensioning device for each package, thus assuring a uniform product.
- Electric stop-motion operates upon breakage or exhaustion of wire at each supply package.
- Machine will accommodate eighteen ten-pound packages of .009 x .047 wire.
- Capstan 36" diameter, 6" face.
- Standard set of twelve change-gears furnished with each machine.
- Machine driven by 2 HP motor.
- New design pay off stand and windup stand as illustrated for accommodating reels from 30" to 48" in diameter. Maximum weight of full reel 5000 pounds.
- Reels raised and lowered hydraulically on both pay off stand and windup stands.
- Pay off stand equipped with adjustable friction-control for desired tension delivery.
- Windup stand equipped with adjustable traverse mechanism.
- Windup stand operated by individual motor through fluid-drive to insure constant rate of draft.
- Machine can be adapted for applying textile coverings with yarn, glass, and various types of synthetics. Copper wire and wires of similar nature can also be applied to other conductors.
- **Pay off stand and windup stand can be furnished separately or in pairs for use with other types of equipment.**

Complete information available on request

WARDWELL Braiding Machine Co.

Central Falls
Rhode Island, U.S.A.

Representatives for Europe, British Colonies and Dependencies
JAMES MACKIE & SONS, LTD., BELFAST, IRELAND



Only WELDCO Monel Pickling Hooks Have Such Universal Acceptance!

OTHER WELDCO PICKLING EQUIPMENT

Mechanical Picklers,
Crates, Baskets,
Racks, Chain,
Steam Jets,
and Accessories

WELDCO

American Steel & Wire Company - - - Donora, Pa.
American Steel & Wire Company - - - - - - Joliet, Ill.
American Steel & Wire Company - - Worcester, Mass.
Bethlehem Steel Corporation - - Sparrows Point, Md.
Bethlehem Steel Corporation - - - - Williamsport, Pa.
Detroit Steel Corporation - - - - - - Portsmouth, Ohio
Electric Auto-Lite Company - - - - - Port Huron, Mich.
Indiana Steel & Wire Company - - - - - Muncie, Ind.
Johnson Steel & Wire Co. - - - - - - Worcester, Mass.
Jones & Laughlin Steel Corporation - - Aliquippa, Pa.
Keystone Steel & Wire Company - - - - - Peoria, Ill.
Lamson & Sessions Company - - - Cleveland, Ohio
National Screw & Manufacturing Co. - Cleveland, Ohio
Pittsburgh Steel Company - - - - - - - Monessen, Pa.
John A. Roebling & Sons Company - - - Roebling, N. J.
Timken Roller Bearing Company - - Gambrinus, Ohio
Union Drawn Steel Division - - - - - Massillon, Ohio
Washburn Wire Company - - - - - New York, N. Y.
Wickwire Spencer Steel Division - - - Buffalo, N. Y.

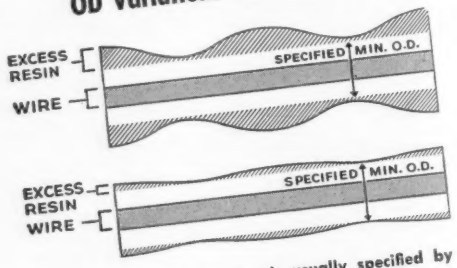
THE YOUNGSTOWN WELDING & ENGINEERING COMPANY
3724 OAKWOOD AVENUE · · YOUNGSTOWN 9, OHIO

U.S.I. POLYETHYLENE PROCESSING TIPS

Choose the Right Resin For Polyethylene Wire Coating

Now that polyethylene is being widely accepted as an insulating material for wire and cable, insulated wire manufacturers and plastics producers are working closely together to provide the best insulations at the lowest possible cost. Although the only true test of a given polyethylene resin is a test run followed by a thorough evaluation of the finished wire, there are certain principles that can be used beforehand as guides. For example:

OD Variations Cost Money



Minimum Outside Diameter is usually specified by the wire customer. But a variation in OD above this minimum uses extra quantities of polyethylene resin — and cuts into extruder profits. These variations can be reduced by using resins with consistant flow characteristics as shown in the lower sketch.

Higher Production Rate Means Higher Profit

The faster a machine can be operated, the more money it can make. But higher rates require tighter controls — especially tighter control of resin properties. A resin variation that might still give a satisfactory product at moderate production rates may not be acceptable when the extruding rate is pushed to its limit. Again, consistency of resin properties is of extreme importance.

Final Properties Are All-Important

Deformation under load, stress-cracking, low-temperature brittleness and spark failure must be kept to a minimum in an acceptable wire and cable insulation. Any resin used, no matter what its processing characteristics, must pass these tests.

Why We Recommend PETROTHENE®

Because we make it — of course. But more than that, PETROTHENE does a good job for wire and cable extruders because our manufacturing process does achieve the high consistency processors are looking for. Shipment-to-shipment, bag-to-bag, and cube-to-cube, variations are held to a minimum. This high consistency enables insulated wire manufacturers to operate at highest rates with minimum OD variation when using PETROTHENE electrical grade polyethylene resins.

PETROTHENE resin properties also measure up to end-use standards for deformation under load, stress-crack resistance, low-temperature brittleness and spark failure.

Three Basic Resins Are Available

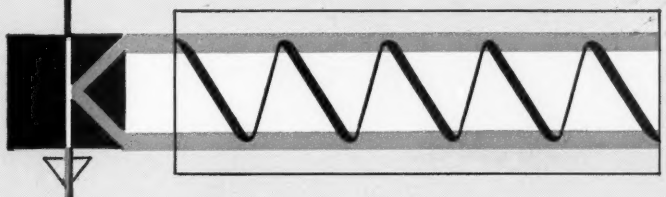
PETROTHENE 300, M.I. = 0.3; PETROTHENE 301, M.I. = 1.0; PETROTHENE 302, M.I. = 2.8. Each available with carbon black, color, JZF antioxidant, and/or non-discoloring antioxidant, compounded to your specifications.

U.S.I. Services

Literature and samples of PETROTHENE electrical grade polyethylene resins are available at your request. U.S.I. Technical Service representatives are also ready to help you with individual processing problems.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers Products Corporation
99 Park Avenue, New York 16, N. Y.
Branches in principal cities

A REPORT FROM KELLOGG ON



KEL-F® GRADE Plastic 500

Results of electrical tests on Grade 500	
VOLTAGE BREAKDOWN	**VOLTS**
Initial volts	13,500
at 150°C.—1 week	13,000
2 weeks	14,600
at 175°C.—1 week	13,500
2 weeks	14,500
at 190°C.—1 week	11,300
2 weeks	9,600

New Fluorocarbon Plastic Formulation Provides Wire Insulation that can withstand Continuous Operating Temperature up to 175° C.

KEL-F PLASTIC, Grade 500—like all the molding compounds in the KEL-F fluorocarbon series—is notable for its extreme resistance to high temperatures, chemical attack, humidity and abrasion.

Of special interest to the electrical field is the higher heat-aging level of wire coatings with the new Grade 500. Tests on wire insulation indicate a continuous operating range of temperatures up to 175°C. Samples of coated wire exposed to temperatures as high as 190°C. for extended periods of time (2-3 months) still maintain relatively high voltage breakdown values.

Results of these electrical performance tests are summarized in the table above. An examination of the breakdown voltages after continuous exposure to high temperatures points up the high heat-aging level reached by KEL-F PLASTIC Grade 500 coated wire.

TWO TYPES AVAILABLE

KEL-F PLASTIC GRADE 500 is produced in two distinct types:

GRADE 500-F, a less crystalline type that resists embrittlement by high temperatures. Recommended for general wire and cable insulation, hook-up wire, thin wall tubing, and spaghetti.

GRADE 500-R, possesses same general properties as F type, only a slightly more rigid formulation. Recommended for use in connector insulation and for coil forms.

MOLDABILITY

The new Grade 500 permits extrusion of high molecular weight coatings and thin wall tubing that resist embrittlement when exposed to higher temperatures. Less crystalline in structure, Grade 500 can be fabricated without danger of splitting or crazing when heated. The flexibility of Grade 500 coated wire is also slightly improved.

TECHNICAL SERVICE

KEL-F PLASTIC Grade 500 is a result of Kellogg's comprehensive research in the field of fluorocarbon chemistry. Our technical staff will be happy to work with you in developing specific applications for the new Grade 500.

REPORT ON KEL-F PLASTIC, GRADE 500

Kellogg's TECHNICAL CUSTOMER Service Staff has prepared a technical report on KEL-F PLASTIC, Grade 500. It contains information on properties, extrusion techniques and operating conditions, electrical tests, and field evaluation of the new 500 Grade. To get your copy, just clip and mail coupon below.

® KEL-F is a registered trademark of The M. W. Kellogg Co. for its fluorocarbon products.

THE M. W. KELLOGG COMPANY
Subsidiary of Pullman Incorporated
Chemical Manufacturing Division
P. O. Box 469, Jersey City, N. J.

Please send me a copy of your First Report on KEL-F PLASTIC—Grade 500.

Name_____

Firm_____ Position_____

Address_____

City_____ Zone____ State_____

Unretouched photograph of *Carboloy R-8 Wire Die*, used for drawing low-carbon steel at the Wyckoff Steel Company, New England Works. After producing 5,014,000 lbs. of wire in 14 years, the inside diameter has increased only .0037". (R-8 die shown 1⅓ times actual size.)

MORE THAN 5,000,000 LBS.
OF WIRE DRAWN DURING . . .

14 YEARS ON THE JOB . . . AND THIS CARBOLOY DIE HAS CHANGED ONLY .0037"

This Carboloy* R-8 die has drawn more than 2000 miles of wire since put in operation in 1942. Yet its inside diameter has changed only .0037" since it was purchased. What's more, the approach has never needed polishing; the wear ring has never needed removing.

This case history is one of the most spectacular in the history of carbide wire dies. But it is a typical example of the extra-long service life you can expect from every Carboloy die.

Equally important, you can depend on savings in grinding and downtime costs . . . longer production runs; smoother, more accurate wire.

Add in the other Carboloy "bonuses" for wire die users: immediate local delivery, on-the-job engineering service, wire-die training school for your personnel, and die servicing and finishing facilities. You'll see why more and more mills specify Carboloy carbide dies.

For engineering service, or your copy of the Carboloy Die Catalog and Service Manual, write: *Metallurgical Products Department of General Electric Company, 11171 E. 8 Mile Ave., Detroit 32, Michigan.*

CARBOLOY

CEMENTED CARBIDES

*Carboloy is a trademark of General Electric Company

ALCOA ALUMINUM WIRE

ALUMINUM COMPANY OF AMERICA

ALCOA BUILDING

PITTSBURGH 19, PA.

For the FINEST Dies...

Specify

There Are Many Reasons Why V-R Leads The Field!

V-R NEW Cylindrical nib and improved method of assembly insure high degree of concentricity.

V-R . . . First in producing the only Tantalum-Tungsten carbide developed specifically for Drawing Dies.

V-R . . . First to manufacture Carbide Dies with preformed rough cored back relief.

V-R . . . First to furnish Carbide Dies rough cored to finish at hole sizes below .010".

WRITE TODAY for NEW Vascoloy-Ramet Die Catalog VR-461.

The New V-R Die Catalog gives complete ordering information on all V-R Dies for drawing wire, rod, bar and tube.

Vascoloy-Ramet CORPORATION

896 MARKET STREET
WAUKEGAN, ILLINOIS

The Wire Outlook

Wire men from the far corners of the earth will be converging anon upon Pittsburgh, the steel capital of the country, for the Annual Convention of The Wire Association. The officers and directors of the Association extend an especially warm welcome to the many members and their guests who will be in attendance at what is shaping up as a record-breaking four-day meeting.

Persons who come to these affairs have an opportunity to glean much important information from the technical sessions and plant tours, but not the least of the values of the meetings are the many favorable circumstances through which one may become acquainted with other operating men to exchange ideas and develop a feeling of industry fellowship.

The party conventions are now a matter of history and record, campaigning is in full swing and election day is just a few short weeks away.

Let's admit that few politicians are simon-pure in their motives or actions. While undoubtedly some Republicans may be justly criticized, the party nevertheless stands out as the one best representative of those principles upon which our own country was founded and became great.

Jefferson, Madison, Monroe and other early American Democrats would probably turn over in their graves, could they hear their modern successors praise them on the one hand and voice policies on the other that savor of demagoguery, socialism —or worse.

In the name of the welfare of the people the political aspirants enounce policies and make promises that they, as intelligent people (some anyway), must know would be ruinous. It would seem that any statement goes, provided it gets votes—never mind the ultimate good of the people! A nationally known business commentator—not a politician—stated that the Democratic platform is a preposterous conglomeration of lurid promises of all things to all people, some parts of which are altogether fraudulent. Is it not a sad spectacle to see a once great party fallen so low that it can only wallow in the mire of calumny and character assassination, endeavoring to set class against class, to gain its objectives? Does any clear-headed, fair-minded citizen want that type of "leadership" in the White House!

To the many dire predictions of doom, the state of the nation gives the lie. Business is good. The people have more money to spend—and are spending it! The country's cash registers are ringing up sales in record volume. Second quarter sales of goods and services were 5 billions ahead of the first and 21 billions ahead of the same period last year. For the second quarter consumer spending was up 2 billions over the first—less for cars, but more for practically everything else. While the steel strike put a dent in third quarter output, it is back to high peaks again. Metal fabricating rose in July during the strike to an index of 171 against 168 for June. The concern of the moment is too rapid an inflationary trend, for which corrective credit and money measures have been taken by Washington.

We can expect steel to be somewhat tight for a few months, but it should be in ready supply by the end of the year. Aluminum demand is now outrunning supply, because of low inventories and the increasing use of the metal in building construction. In spite of reduced prices, copper sales are off, with a pick-up expected in the Fall. Nickel, as usual, is hard to get, but the Government has permitted the diversion of 20 million pounds to industry in the third and fourth quarters to ease the situation.

Rod and wire prices are up, which may bring a new influx of foreign wire. Low and unbalanced stocks will require a couple of months to get back to orderly scheduling. Most non-integrated mills operated through the strike without interruption, but rod inventories were becoming low.

Electric wire and cable mills are keeping busy and the brass mills' sales have been lighter than normal.

For the last quarter, it looks as though wire drawers will be operating at capacity, although the integrated mills are having difficulty in building stocks.

We can only maintain the kind of America we want through each citizen doing an intelligent job at the polls. The job this year is to elect men who will keep our country strong, prosperous and respected in the eyes of the world. Labor, white collar workers and management are not conflicting classes—they are partners and fellow workers. We must keep it that way!

—from the Editor's Desk

We'd even WALK to PITTSBURGH

for the Annual Wire Association Convention.

Yes, we'll be there on October 29th!

Each year we look forward to greeting our old friends, and to making new friends among the members of the wire industry.

We're setting up the "STEELSKIN" Stand in Room 735 of the Hotel Penn-Sheraton from October 29th through the 31st. Be sure you stop in for a bit of relaxation and entertainment.

See you then . . .

Steelskin
REG. U.S. TRADE MARK

METAL WORKING LUBRICANTS

R. H. MILLER

COMPANY, INC., Homer, N. Y.

WIRE
AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 31 October, 1956 No. 10

Electromatic Oil Tempered Wire

by George A. Sweitzer
Metallurgical Investigator
Aliquippa Metallurgical Department
Jones & Laughlin Steel Corporation
Aliquippa, Pennsylvania

I
Electromatic Oil Tempered Wire

The last few decades have been marked by tremendous strides in industry. Today our modern life is not complete without appliances and gadgets of all descriptions. The scope and complexity of new machines is ever on the increase.

★ ★ ★

To produce such machines requires an infinite number of intricate parts. Among the more important of these are springs. In fact, very few modern gadgets or appliances will operate properly without one or more springs. These parts may be made from a variety of materials in almost innumerable shapes. Steel is, without doubt, the most versatile of these materials. Our discussion deals with Jones & Laughlin's Electromatic Oil Tempered wire used in producing steel springs for special applications.

★ ★ ★

In producing springs from high carbon steel wire, physical properties desired and economic factors determine specific applications. A hard drawn wire formed into a spring will tend to "take a set" even though stress relieved after forming. By "taking a set" we mean having a relatively low elastic limit whereby a part from such stock will tend to deform in use. A good example of this is an upholstery cushion whose springs have shortened in height while in service.

George A. Sweitzer

This paper was prepared for presentation at the Annual Convention of The Wire Association at Pittsburgh, Pa., on October 30, 1956.

Mr. Sweitzer attended Geneva College and Ohio State University. He has held various positions in the Metallurgical Department of J & L's Aliquippa Works and is currently Metallurgical Investigator in the Wire Mill, a position he has held since 1951.

★ ★ ★

Figure 1 is a stress-strain curve from a typical .135" hard drawn spring steel wire. You will notice that the curve deviates from the modulus line at a relatively low position. The modulus line is the ratio of stress to strain. For steel, this ratio is approximately 29,400,000. A stress relieving heat treatment of approximately 500°F will cause the curve to follow this modulus line somewhat higher with but a small increase in ultimate tensile strength.

★ ★ ★

There are many applications for springs in which a relaxing of tension in service cannot be tolerated. Examples of such uses are overhead garage door springs, valve springs, clutch springs and automatic transmission springs. In such cases, a quenched and tempered steel with a high yield point and elastic limit performs a yeo-

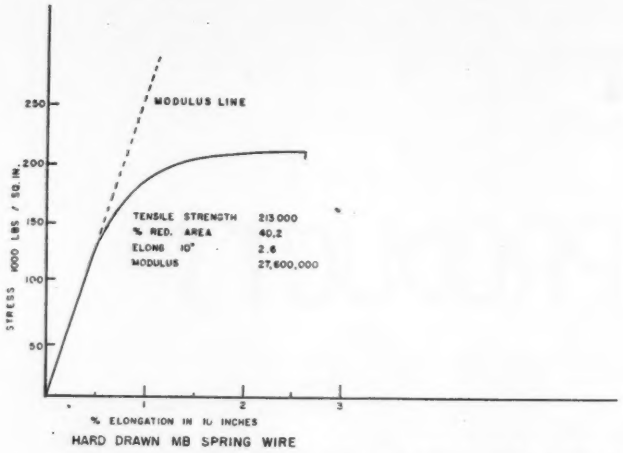


Fig. 1—Stress-Strain Diagram of .135" Hard Drawn MB Spring Wire.

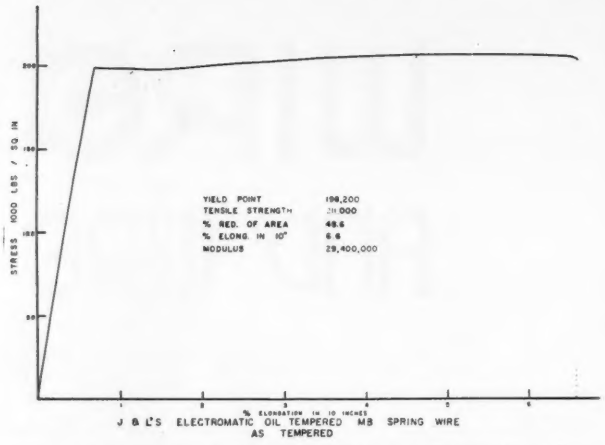

STRESS 1000 LBS / SQ IN
YIELD POINT 198,200
TENSILE STRENGTH 211 000
% RED. OF AREA 48.6
% ELONG. IN 10" 6.6
MODULUS 29,400,000
% ELONGATION IN 10 INCHES
J & L'S ELECTROMATIC OIL TEMPERED MB SPRING WIRE
AS TEMPERED

Fig. 2—Stress-Strain Diagram of J&L's ¼" Electromatic Oil Tempered Wire. Stress Relieved after Straightening and Cutting.

man job. Figure 2 is a stress-strain curve of an oil tempered spring steel wire of ¼" diameter. The curve follows the modulus line almost to the yield point. The elastic limit and yield point practically coincide at a load that is over 90% of the ultimate tensile strength. Another salient feature of such a product is the high percentage of elongation as compared with the cold drawn product. The 6% plus indicated here was measured as strain under load prior to failure.

★ ★ ★

In practice a fabricator may employ a high carbon steel wire, form into required shape and heat treat to desired hardness. Or, as an alternative, purchase wire that has been heat treated to desired hardness, form to proper shape and stress relieve. Due to the high ductility of an oil tempered wire many forming jobs may be produced by this latter method.

★ ★ ★

A heat treated steel when deformed contains residual stresses which detract from its desirable physical properties. The stress-strain diagram in Figure 3 was produced from straightened-and-cut wire where the straightening dies were used to flex the wire. This illustrates the physical properties obtained when oil tempered wire is formed into a spring.

★ ★ ★

Observation will disclose the early deviation of the curve from the modulus line as well as the indefinite yield point. Such a product performs in much the same manner as a hard drawn material.

★ ★ ★

By the application of a stress relieving heat treatment the original high physical properties are restored. Holding the part at approximately 500°F for a few minutes is generally sufficient to produce the desired result. Figure 4 will illustrate the restoration of the high yield point by such a baking operation.

★ ★ ★

Figure 5 is a stress-strain diagram of .250" diameter wire showing all three stages: as-tempered, after forming and stress relieved.

★ ★ ★

It will be noted that the dot-dash line representing "after

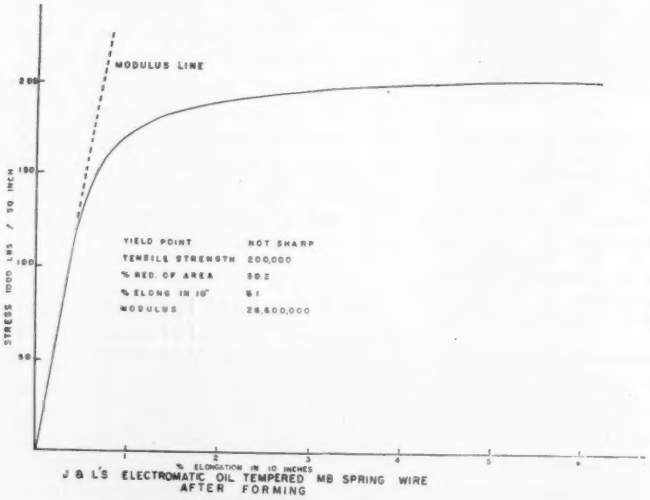


Fig. 3—Stress-Strain Diagram of J&L's ¼" Diameter Electromatic Oil Tempered Wire After Straightening and Cutting. Resembles Spring after Forming.

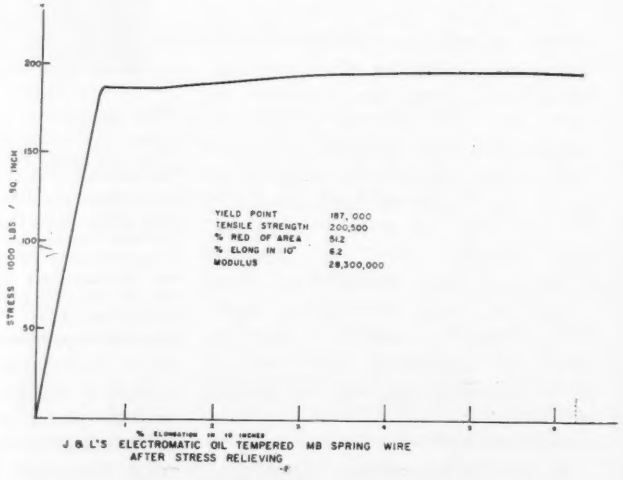


Fig. 4—Stress-Strain Diagram of J&L's Electromatic Oil Tempered MB Spring Wire ¼" Diameter.

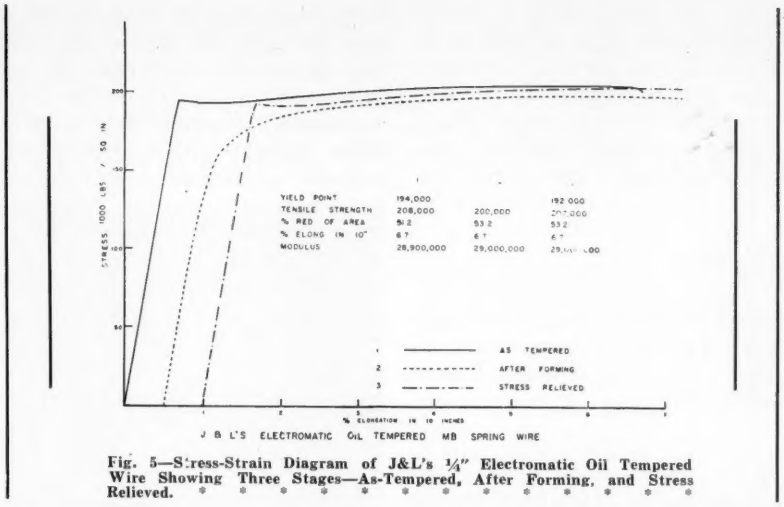

STRESS 1000 LBS / SQ IN
YIELD POINT 194,000
TENSILE STRENGTH 208,000 200,000 192,000
% RED OF AREA 54.2 53.2 53.2
% ELONG IN 10" 6.7 6.7 6.7
MODULUS 28,900,000 29,000,000
1 AS TEMPERED
2 AFTER FORMING
3 STRESS RELIEVED
% ELONGATION IN 10 INCHES
J & L'S ELECTROMATIC OIL TEMPERED MB SPRING WIRE

Fig. 5—Stress-Strain Diagram of J&L's ¼" Electromatic Oil Tempered Wire Showing Three Stages—As-Tempered, After Forming, and Stress Relieved. * * * * * * * * * * * * *

stress relieving" is very similar to the continuous line of the "as-tempered" material. The broken line of "after forming" is in sharp contrast to either of these.

II

The production of oil tempered carbon steel wire is accomplished in conventional methods by heating the wire to 1550°F or higher by passing it through a furnace or lead pot and subsequently quenching in oil (at 125°F), after which it is re-heated in a lead pot for tempering. In this process, all heating is accomplished by heat transfer from lead pot, or furnace, to wire and quenching directly to martensite from austenitizing temperature. In heating, the temperature of the wire center lags behind. To attain uniform heating across the section, the outside portion of the wire must be maintained at temperature for an appreciable period of time. This results in some undesirable grain growth.

★ ★ ★

Under such heating conditions, it is not possible to quench the wire the instant it reaches the desired degree of heat throughout its cross-section. Due to the space between the heating unit and the oil quench, temperature of wire actually drops in passing from furnace to quenching tank.

★ ★ ★

In practice, expediency in heating demands the use of a heating medium operating at a temperature higher than that actually required for proper hardening. This practice results in some austenitic grain growth and a relatively coarser martensitic structure after quenching. Figure 6 is a typical quenched and tempered product of this type at 500 diameter magnification.

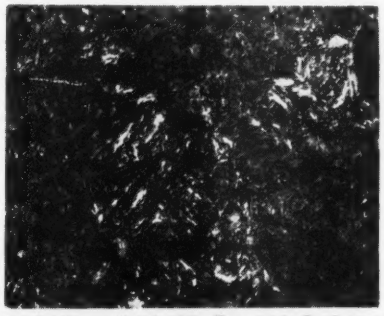


Fig. 6—Conventional Oil Tempered Product — .250" Wire at 500X, Nital Etch. * * * *

III

In the production of our Electromatic Oil Tempered wire on the Trauwood units, radically different heating and quenching practices are employed. Wire strands from the pay-off reels enter a lead contact bath held at approximately 900°F which serves in part to preheat the stock. From this bath through insulated troughs the individual strands move to an alloy contact bath at approximately 550°F. An alternating current generator is connected to these contact baths with a transformer unit coupled in this circuit for control purposes. In passing current through the wire strands they are heated by electrical resistance to the maximum temperature desired. Since wire strands are in motion, the maximum temperature is attained just as the wire enters the second contact, or alloy, bath. Adjustment of current voltage through saturable core reactor, or induction regulator, permits very accurate control of heating and, in this case, a quenching temperature of 1550/1620°F.

★ ★ ★

Wire strands entering the alloy bath are quenched below the knee of the time-temperature-transformation (S) curve before any transformation begins. Immediately thereafter, strands enter the oil quench bath for final quenching to martensite. Figure 7 is a graphic illustration of this interrupted quenching cycle. The dash-dot line represents the temperature change in quenching through alloy and oil baths.

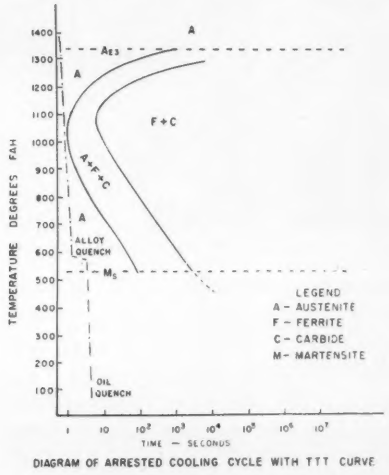


Fig. 7—Isothermal Transformation (S) Curve Showing 2-Phase Quenching Cycle. * * * *

This is a modification of martempering practices employed by heat treaters to attain high hardness and ductility unobtainable by other methods.

★ ★ ★

Subsequent tempering of the martensitic structure is obtained in the lead tempering bath following the quenching cycle. Controlling temperature here governs the final physical properties of finished wire. After tempering, the wire is wound on take-up blocks of suitable size. Figure 8 is a schematic diagram of this process.

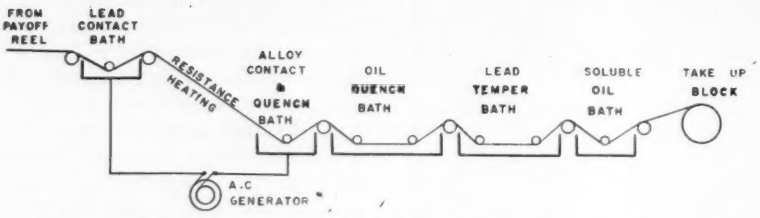


Fig. 8—Schematic Diagram of Trauwood Oil Tempering Unit. * * * * * * * *

The soluble oil tank shown serves no purpose in heat treatment of wire. It is used to apply a coating of sulphonated oil to wire surface for lubrication and preservation. This and other features can be seen in photograph of the operational frame in Figure 9.

product. In some cases, users purchase oil tempered wire merely to obtain stock that will uncoil into straight lengths.

★ ★ ★

In the Electromatic process, the emphasis is on quick heating and

Homogenization tends to stabilize the austenite and to increase the probability of retaining untransformed austenite after quenching. Consequently austenitized material with carbon concentration gradients may contain more martensite after quenching than a similar steel quenched after longer austenitizing treatment. The presence of untransformed austenite in any hardened steel produces lower hardness before tempering and results in the presence of untempered martensite or pseudo-pearlite after tempering.

★ ★ ★

Experiments with induction heat-

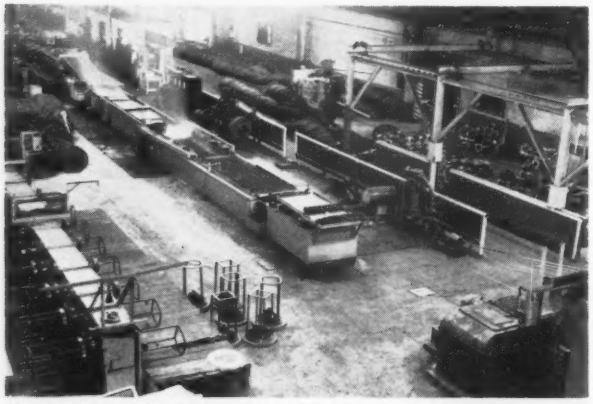


Fig. 9—Photograph of Trauwood Oil Tempering Frame. * * * * *

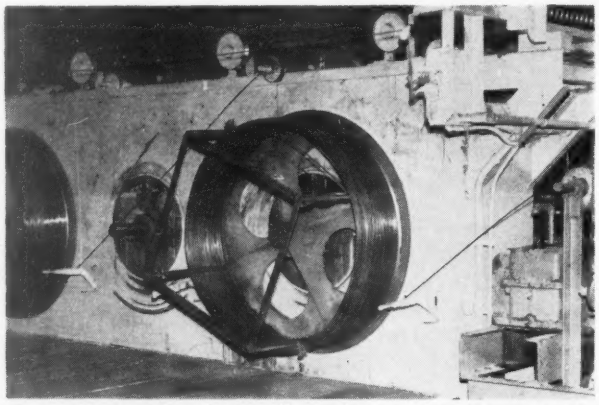


Fig. 10—Photograph of Finished Wire Coiling on 4-Foot Diameter Blocks.

IV

An outstanding feature of this product is a so-called "straight cast." This means wire will straighten out when released from coil tie wires. Sufficiently large diameter blocks are used for each size on take-up frame to prevent exceeding the yield point in outer fibers of wire. Our practice is to coil the smallest sizes (.035″ to .076″) on a 22″ block; sizes .080″ to .090″ on 26″ block; sizes .091″ to .142″ on 36″ block; sizes .148″ to .218″ on a 48″ block; and sizes .219″ to .312″ on a 60″ block.

★ ★ ★

Figure 10 is a photograph showing finished wire on a four foot block.

★ ★ ★

A straight cast permits spring makers to operate without straightening devices on their coiling machines and insures a high degree of uniformity in coiled

close control. An even rate of heating is secured throughout the cross-section. Research has indicated that the formation of austenite from ferrite-cementite aggregates is a nucleation and growth process. The first austenite formed is not homogeneous but contains carbon concentration gradients. A homogeneous austenite is obtained only after relatively long holding periods.

★ ★ ★

The time necessary to produce a homogeneous austenite depends upon rate of heating, maximum temperature and the nature of preexisting structure. A fine pearlitic structure will transform and homogenize at a much faster rate than a coarse pearlitic one. Cold work will further increase this transformation rate. For this reason, it is beneficial to lead quench patent (or air cooled patent and severely draft) stock to be oil tempered on the Trauwood units.

ing indicate that very fast heating with immediate quenching results in a type of martensite with greater fineness than obtained by other heating methods.

★ ★ ★

Thus, in the Electromatic process, we obtain rapid electrical resistance heating for quick austenitizing and partial breakdown of carbon concentration gradients. Immediate quenching in an alloy bath at an intermediate temperature avoids the danger zone in the vicinity of 1000°F. The physical stresses of contraction set up by this rapid quench, from approximately 1600°F to alloy temperature (450°F to 575°F), are relieved before martensite transformation takes place in the oil quench. A fine grained martensite is obtained with practically no retained austenite and less residual stresses in much the same manner as in a true martempering process.

Figure 11 is a photomicrograph of a .250″ oil tempered wire showing the fine martensitic structure. In contrast with this is the somewhat coarser structure of a conventionally oil tempered wire shown in Figure 6.

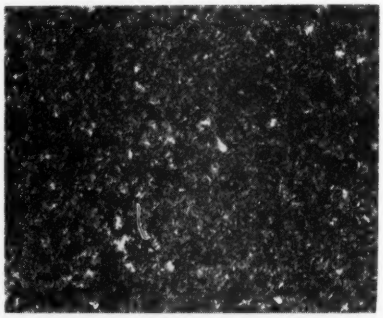


Fig. 11—J&L Fine Martensite—.250″ diameter Wire at 500X, 2% Nital Etch. * * * * *

By stopping the heated wire in the alloy quench bath, a bainite structure can be obtained. Figure 12 is a microstructure of such a wire held in this manner for fifteen minutes at 470°F. Physical properties of material are unique. Very high tensile strength is present with fair amount of ductility. While it is impractical to produce material in this way for commercial purposes, it illustrates the many possibilities available in heat treating.

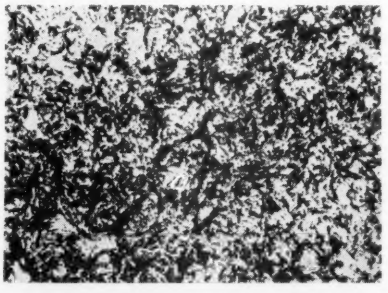


Fig. 12—Bainite Structured Produced by Stopping Heated Wire so that Portion was Held in Alloy Pan for 15 minutes at 475°F. * * * * *

The physical properties of Electromatic Oil Tempered wire vary somewhat from that produced in the conventional processes. With the ultimate tensile strengths being equal, the yield point of electrically tempered wire will be approximately 2% to 5% higher than the conventionally tempered wire. In the smaller gages, this yield to tensile strength ratio may be as much as 96% or 97%. The conventional product will be somewhat over 90%. To an engineer studying fatigue properties, this indicates a better service life. Experiments conducted by certain spring manufacturers some years ago confirm this longer life expectancy with electrically tempered wire.

★ ★ ★

The Rockwell "C" hardness of the Electromatic material is 1 to 2 points lower than that of conventionally treated wire of similar tensile strength.

★ ★ ★

Our product is free of quench cracking which is a hazard in conventional oil tempering. This in itself demonstrates the lower residual stresses inherent in the product.

★ ★ ★

After considerable experimental work, we have determined that certain prior treatment produces the best final product. The rapid heating and immediate quenching cycle has been described with its beneficial fine grain resulting in a tougher product. The product is made even tougher if the microstructure of wire to be oil tempered is properly prepared in advance.

★ ★ ★

To prepare the microstructure properly for oil tempering, we patent anneal prior to drawing to size. In the larger sizes, where percentage of draft is low, lead quench patenting with its finer pearlite is preferred. Smaller sizes may be produced from air cooled patented stock with heavier drafting.

★ ★ ★

The high yield strength to tensile strength ratio, so beneficial to long fatigue life, can be a hardship in wrap testing, bend testing, or severe forming. Any surface pits or imperfections create a notch-effect that may seriously impair quality of product. To minimize this condition, care must be exercised to eliminate surface defects from stock and iron out surface pits by drawing techniques.

★ ★ ★

Due to inability of welded or hooked joints to conduct proper current for uniform heating, all coils must be trimmed for several feet on each side of joints. This results in greater trimming loss with Electromatic Oil Tempering.

★ ★ ★

Close control of chemistry is another must. In the smaller sizes, a minimum of .63 carbon is essential with a manganese content of .65/.85% to obtain complete hardening. As size increases, so must the chemistry. Until recent years sizes over .187″ required a minimum manganese content of .85% with carbon preferred on the high side. Heats with manganese content over one per cent were apt to be susceptible to bend test failures in our testing procedure or too brittle to form in some spring applications.

★ ★ ★

To obtain deeper hardening with lower manganese for increased ductility, some experimental work was done with boron additions. Initial research heat and full heats produced in the open hearth were very promising. Continued use of boron revealed it to be rather uncertain with no convenient chemical test available to determine whether deep hardening properties were present. The jominy end quench test proved to be a good barometer of hardenability. Additional work was indicated.

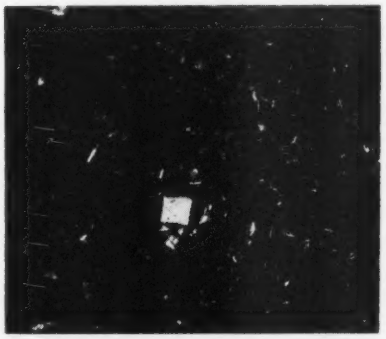


Fig. 13—Photomicrograph Showing Cubical Crystal of Zirconium Compounds in Tempered Martensitic Matrix—500X, 2% Nital Etch. * * *

With assistance of the Research Department, additions of zirconium were made to attain necessary hardenability and retain sufficient ductility. It was determined that

(*Please turn to page* 1278)

Hot Dip Wire Aluminizing Processes and Alloys

by J. D. Sprowl
Physical Metallurgy Branch
Department of Metallurgical Research
Kaiser Aluminum & Chemical Corporation
Spokane, Washington

In the field of steel wire coating, the bright figure of aluminized wire is beginning to grow. More and more wire producers are being drawn to the shining surface appearance, outstanding corrosion resistance and low cost of aluminum.

★ ★ ★

During the past seven years, **Kaiser Aluminum and Chemical Corporation's** Department of Metallurgical Research has been at work developing aluminum alloys designed to give optimum coating characteristics. These alloys, although costing more per pound than zinc, are actually about one third cheaper than zinc for an equivalent area of surface coverage. For the past five years Kaiser Aluminum has been working with wire manufacturers in evaluating processes and alloys on the pilot plant scale as well as in the laboratory. This cooperation is fostered by a mutual appreciation of the advantages to be gained by aluminizing steel wire. These advantages include:

1. **Increase in corrosion resistance.**
2. **Elimination of dissimilar metal contact between aluminum and steel.**
3. **Maintenance of good surface appearance throughout extended service.**

★ ★ ★

Aluminum is inherently a white, lustrous metal, and retains its good appearance when coated on steel. As a corrosion resistant coating, aluminum is expected to displace much zinc and to create additional applications. The tenacious, transparent and insoluble oxide film which forms on aluminum generally enables it to provide longer protection for steel than the deliquescent and soluble corrosion products which form on zinc, particularly in sulfurous atmospheres.

John D. Sprowl

This paper was prepared for presentation at the Annual Convention of The Wire Association in Pittsburgh on October 29, 1956. **Mr. Sprowl joined the Department of Metallurgical Research of Kaiser Aluminum and Chemical Corporation in 1955 as a Research Engineer to work on the aluminizing of steel. Prior to his association with Kaiser Aluminum, he spent four years at the Atomic Energy Commission's Hanford Works as an Engineer for General Electric Company in developing nuclear reactor fuel element fabrication processes. He received a B.S. in Engineering Chemistry from Stanford University in 1949, and an M.S.E. in Metallurgical Engineering from the University of Michigan in 1951. He is a veteran of three years service in the Navy during World War II.**

What is Aluminized Wire?

Aluminized steel is composed of three principal components, as shown in Figure 1. From top to bottom are:

1. **The aluminum layer, which provides corrosion protection, luster and color to the coating.**
2. **The intermediate zone of intermetallic compound which is hard, brittle, and heat resistant, and which forms the metallurgical bond between the coating and the steel.**
3. **The base metal, which may be plain carbon or alloy steel.**

The ductility of the coated wire is largely determined by the thickness and hardness of the intermediate zone. A thin layer enhances wrap ductility and drawability. However, the minimum wrap diameter is also dependent upon the wire gauge; better coating ductility is displayed as wire size decreases.

★ ★ ★

Aluminized wire is readily redrawn. Since the coating operation anneals the steel, redrawing is required to obtain high strength. Luster and surface texture of as-coated wire also may be further improved by redrawing about 5%.

★ ★ ★

The best characteristics of aluminized wire are obtained only when certain basic requirements for good coating are met. These requirements are, in some respects, more rigid than those encountered in galvanizing.

Requirements for Successful Aluminizing

Coating steel with metals by continuous hot dip methods requires high standards of steel surface cleanliness, smoothness of

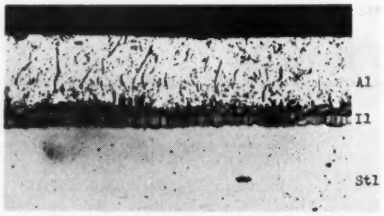


Figure 1.—Microstructure of aluminized steel
½% Etch, 500X
Al—Aluminum
1L—Interfacial Layer
Stl—Steel

mechanical operations, and control of bath temperatures, immersion path length, coating speeds and alloy composition.

★ ★ ★

Cleanliness of the steel surface is, perhaps, the principal requirement in aluminum coating. It is mandatory for complete coverage of the steel. Experience shows that poor coverage invariably results from failure to attain a chemically clean steel surface. However, no direct means of determining when a steel surface is chemically clean prior to coating is available at this time.

★ ★ ★

For good appearance, the outer coating layer must be substantially free of discontinuities. Rust discoloration may occur at small defects when steel is exposed to the atmosphere. The discoloration does not indicate premature failure of the wire, but it detracts from the appearance of the coating and reduces sales appeal.

★ ★ ★

In natural environments, both oxide-covered aluminum and oxide-covered zinc are anodic to steel. When the resistance of the electrolyte is low, as in solutions containing chlorides, complete galvanic protection of steel exposed at coating discontinuities on aluminized and galvanized steel is obtained. In static solutions, about 10% less current flows in the aluminum-iron couple than in the zinc-iron couple (Ref. 1). However, in relatively non-corrosive atmospheres, the electrolyte consists of a thin, high resistance film of condensed moisture. This high series resistance between the dissimilar metals reduces the galvanic current. Under these conditions, zinc still offers complete galvanic protection to steel, while aluminum only partially protects steel so that, initially, slight rusting occurs at sheared edges and at holes in the aluminum coating. However, the rate of corrosion of the exposed steel is much less than that which occurs when the steel is not in metallic contact with the aluminum. Under some conditions the initial rust may subsequently be reduced to magnetite leaving nothing but a superficial dark stain on the steel surface (Ref. 2).

★ ★ ★

An aluminizing production line must be well constructed to eliminate sources of jerking and vibration of the wire. A roughly running line frequently causes rupture of the surface oxide film on the molten coating. This allows the aluminum to drain erratically from the steel after withdrawal from the bath and results in varying coating thicknesses. Furthermore, the wire should emerge vertically from the coating bath, in most instances, to maintain coating uniformity.

★ ★ ★

The bath temperature, speed of coating and cooling rate of the wire also require close control. High temperatures promote rapid growth of the interfacial layer and consequent loss of ductility in the coating. The speed of travel and the length of the immersion path in the aluminum bath determine the contact time between the aluminum bath and the steel wire. In turn, the two factors affect the coating ductility. For example, slow coating speeds and long immersion paths permit extended exposure of the wire to the molten aluminum, which produces a thick intermetallic zone. With a slow coating speed, the rate at which the wire is withdrawn from the aluminum bath results in a thin aluminum layer in the coating. The combined effects of a heavy layer of intermetallic compound and a thin layer of aluminum result in poor coating ductility. It is found that an aluminum layer at least three to five times the thickness of the intermetallic zone gives best formability. The cooling rate of the wire after coating should be as rapid as practicable, because diffusion between the steel and aluminum continues during the time the coating remains molten.

★ ★ ★

As stated earlier, high quality aluminizing depends on conformance to a few basic requirements. These requirements may be more easily attained in some processes than in others.

Aluminizing Processes

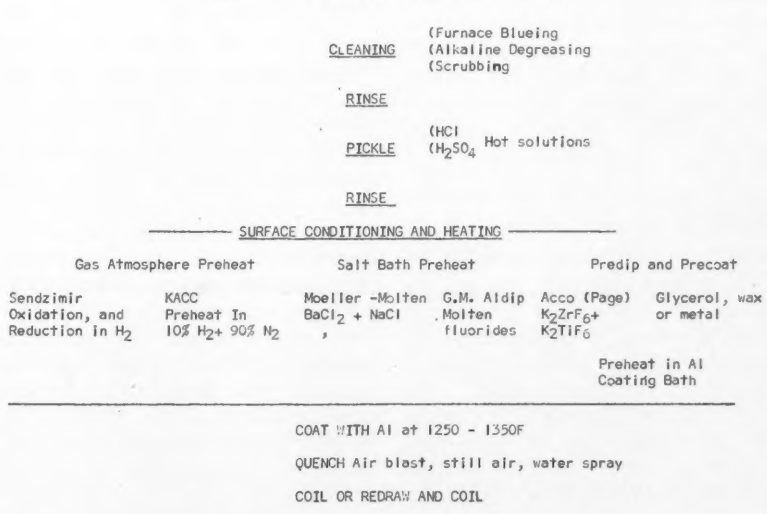
Many methods for aluminizing wire are available, and generally incorporate five unit operations: (1) degreasing, (2) pickling, (3) surface conditioning and heating, (4) coating and (5) cooling and coiling.

★ ★ ★

The drawn steel wire is first

Figure 2

TYPICAL UNIT OPERATIONS IN WIRE ALUMINIZING



cleaned preparatory to coating. Conventional methods may be used, such as furnace blueing or electrolytic alkaline cleaning, followed by pickling in hot sulfuric or muriatic acids and rinsing in fresh water.

★ ★ ★

When the wire is clean, it must be heated to about 1250-1350 F. While heating, the wire surface must remain free of oxides so that it can combine with the coating metal.

★ ★ ★

Three general methods for heating the steel surface under non-oxidizing conditions are used, namely, preheating in a gas atmosphere, or in a salt bath, or heating in the coating bath itself after the steel has been either predipped in an aqueous halide solution, or precoated with an organic or thin metal film. Examples of the processes are given in Figure 2.

★ ★ ★

Galvanized wire producers are familiar with the Sendzimir process in which the steel is first slightly oxidized, and the oxide subsequently reduced in a heated hydrogen atmosphere to form a layer of elemental iron on the steel surface (Ref. 3). The iron reacts readily with molten aluminum to form an adherent bond. Another gas preheat process developed on a pilot plant scale by Kaiser Aluminum and Chemical Corporation is one in which freshly pickled steel is heated to the coating temperature of 1325F in a bright annealing atmosphere such as 10% H_2 and 90% N_2. Many other gas preheat processes are known and are probably suitable technically, if not economically.

★ ★ ★

An example of the salt preheat method is the Moeller process in which clean wire is heated in passing through a bath containing molten barium chloride and sodium chloride of greater density than the aluminum (Ref. 4). After heating, the wire is coated with aluminum as it emerges through a layer of the molten metal 3″ to 4″ thick, which floats on the salt in the same furnace.

★ ★ ★

Another salt preheat process which may be mentioned is the General Motors Aldip process (Ref. 8). In this method, the work is heated in a molten halide salt flux contained in one furnace, followed by coating in an aluminum bath contained in a second furnace. It is not known if the Aldip process has been used in experimental or commercial continuous wire aluminizing.

★ ★ ★

The Page Steel and Wire Division of **American Chain and Cable Company** employs a hot aqueous halide predip solution to provide a covering of alkali zirconium and titanium fluoride crystals which protect the steel from oxidation and also flux the steel surface (Ref. 5). The salts remain on the wire surface after the water evaporates. The wire is then both heated and coated in the aluminizing bath.

★ ★ ★

The use of glycerol, copper, tin and zinc precoats on the wire surface has been reported by Hughes, et al (Ref. 6), but the extent of application and the characteristics of wire subsequently aluminized are not known in detail. It is stated that wire precoated with copper might show inferior corrosion resistance of the aluminum coating, because the copper content of the aluminum increased through dissolution of the precoat.

★ ★ ★

Aluminizing equipment is similar to galvanizing equipment with the possible exception of the aluminum holding furnace. Molten aluminum dissolves metals, hence refractory lined furnaces are required in lieu of the metal pots frequently used in galvanizing. Gas preheat and aqueous halide predip processes may utilize a low frequency induction furnace. The induction furnace is relatively expensive, but provides close temperature control and rapid heat input. The oil or gas fired reverberatory furnace with a sidewell may also be used. The reverberatory furnace is inexpensive, but requires a large metal inventory, heating efficiency is low, and the working conditions may be unfavorable.

★ ★ ★

Submerged electrode resistance furnaces may be employed particularly in salt preheat processes. These units provide efficient heating, good temperature control, comparatively low initial cost, and elimination of special equipment for heating the wire, as required in gas preheat processes. The heating medium and coating bath may be contained in a single unit. Furthermore, metal inventories and contact time between the aluminum and steel are minimized, particularly in the Moeller process.

★ ★ ★

A serious problem in continuous aluminizing involves the material for sinker rolls. These rolls must be refractory except in the Moeller process where metallic rolls are used because they do not contact the aluminum. Iron or steel rolls dissolve in the coating bath and form iron dross, which may roughen the coating if allowed to accumulate. Silicon carbide, graphite and stabilized zirconia have been unsatisfactory. New refractories, such as silicon carbide bonded with silicon nitride, may provide the answer to this problem.

★ ★ ★

The choice of aluminizing processes is broad, but should be governed by two considerations; first, that the process is economical, and, second, that it is capable of producing high quality products. The quality of the products may be enhanced by the characteristics of the coating alloy.

Aluminizing Alloys

The selection of coating alloy is an important consideration in aluminizing wire, because good appearance and wire ductility, in addition to corrosion resistance, are desirable. Alloys which may be used include aluminum-silicon alloy and alloys developed in the Depart-

ment of Metallurgical Research of Kaiser Aluminum & Chemical Corporation. These Kaiser alloys contain silicon, titanium and chromium, and optionally, boron, molybdenum and beryllium in aluminum. Commercially pure aluminum has also been used, but some difficulty has been experienced in obtaining ductile coatings because of the thick intermetallic layer formed between the aluminum and steel.

★ ★ ★

Several reasons exist for alloying the coating. First, alloying facilitates coating by lowering the bath melting point, and by increasing the fluidity of the bath and the ability of the aluminum to wet the steel. Second, alloying improves coating ductility by decreasing the thickness and hardness of the intermediate zone of intermetallic compound (Ref. 6, 7). Third, alloying improves the coating appearance, by preventing the formation of heavy oxide films on the bath surface which may stain the coating, by reducing the grain size of the coating, and by producing a smooth, lustrous surface texture. The functions of various alloying elements are shown in Table 1.

TABLE I

FUNCTIONS OF ALLOYING ELEMENTS IN ALUMINIZED COATINGS

Primary Additions	
Al	Base metal
Si	Inhibits Fe-Al diffusion. Decreases interfacial layer thickness. Lowers alloy melting point.
Fe	Refines grain size. Increases luster
Secondary Additions	
Na	Increases wettability of bath. Modifies Al-Si alloys.
be	Prevents oxide staining. Inhibits Fe-Al diffusion.
B, Ti, Cr, Mo, Zr, V, %	Increase luster.
Mo	Increases bath wettability.
Zn, Mg	Increase whiteness.

The principal alloying elements in aluminum coating alloys are silicon and iron. Silicon reduces the melting point of aluminum, thus lowering the minimum permissible operating temperatures. The thickness of the intermetallic zone is markedly decreased with silicon additions up to about 4%, and the structure of the layer is altered from a hard, finger-like formation to a softer banded-type formation, as shown in Figure 3. The combination of a thinner intermediate zone of intermetallic compound and its modified ribbon-like structure provide greater ductility in the coating than that obtained when commercially pure aluminum is used. However, alloys containing more than 3% silicon darken during weathering. The darkening does not indicate a decrease in the protection against corrosion, but it detracts appreciably from the appearance. The best silicon content is 2 to 3 per cent.

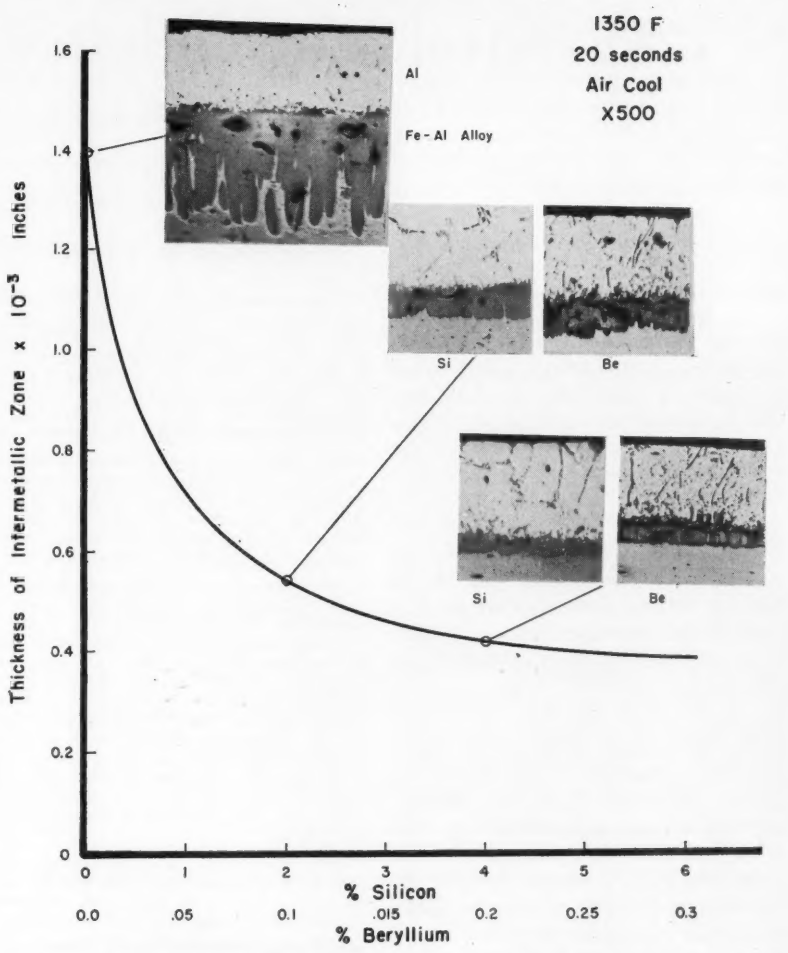


Fig. 3—Average Intermetallic Zone Thickness on Aluminized Steel. * * * * *

★ ★ ★

Accumulation of iron in the coating alloy occurs as a natural consequence of passing the steel through molten aluminum. Fortunately, about 1 to 2% iron increases the luster of an aluminum-2.5% silicon coating alloy. When the iron concentration exceeds 2.5%, iron-aluminum intermetallic compounds form in the molten bath at operating temperatures, and in the coating during cooling to produce rough surface textures. The iron content may be reduced to about 1.5% iron by lowering the bath temperature of aluminum-silicon alloys to about 1220F and sludging. In practice, however, the iron content is reduced to about 1.8 to 2.3% by cooling to 1260F. Lower temperatures cause coprecipitation of other alloying additions in the form of intermetallic compounds. These losses must then be replaced. The coating ductility is also slightly reduced when the iron content exceeds 2% in the alloy. Rapid iron build-up occurs when unprotected iron or steel sinker-roll supports are exposed to the melt. The solution to this problem lies in a suitable refractory coating on the steel, or perhaps, refractory supports. Currently, laboratory work is di-

(*Please turn to page* 1273)

The Steel Wire Industry in Australia

by James Kenneth MacDougall
Wire Consultant
Rylands Brothers (Aust.) Proprietary Ltd.
Newcastle, N. S. W., Australia

This paper was prepared for presentation at the Annual Convention of The Wire Association at Pittsburgh, Pa., on October 30, 1956, and will be delivered by John A. Macpherson, American Representative of The Broken Hill Proprietary Co. Ltd., New York, N. Y., in the absence of Mr. Macdougall.

The author is a chartered mechanical and electrical engineer, a member of the Institution of Electrical Engineers, London, an associate member of the Institute of Engineers, Australia, and a member of The Wire Association, U.S.A.

He has been associated with the Australian wire industry and been responsible for the design of most of the equipment used in the wire mills there from 1911 to 1952. He was Joint Manager of the Austral Nail Co. and Rylands Brothers (Aust.) Pty. Ltd. and from 1925 to 1952 was Manager of the latter. Since his retirement he has been a consultant to the company, but is also Chairman of Lysaght Bros. & Co. Pty. Ltd., the Australian Wire Rope Works Pty. Ltd., and Bullivants Australian Co. Pty. Ltd.

Mr. Macdougall is a foundation member of the Council of the N.S.W. University of Technology and Honorary Doctor of Science of that University.

Australia is about the same size as the United States and due to climatic conditions, the major population and industrial development are necessarily concentrated in the coastal fringe, principally in New South Wales and Victoria.

★ ★ ★

The transport of iron ore is by sea to the two Australian Steel Works, which are situated on the coal fields and convenient to the areas of highest steel consumption (Fig. 1).

★ ★ ★

In 1915 the Newcastle Steel Works of the Broken Hill Proprietary Company Limited started production and a Morgan rod mill was installed in 1918, producing 5 gauge to 7/0 gauge in 280 lb. bundles. A 10″ merchant mill subsequently installed supplies coiled rounds 3/8″ to 1″ diameter in 600 to 900 lb. bundles for the wire industry.

★ ★ ★

In 1952 the Australian Iron & Steel Ltd. at Port Kembla, a subsidiary of the Broken Hill Proprietary Co. Ltd., installed a composite merchant mill equipped to produce wire rods, 5 gauge to 5/8″ in 500 lb. bundles, thus supplementing supplies to the wire industry.

★ ★ ★

Both Steel Works are situated on tidewater, Newcastle being 100 miles north, and Port Kembla 55 miles south, of Sydney, capital city of New South Wales.

★ ★ ★

98% of Australian wire production is concentrated in three wire mills, Rylands Bros. (Australia) Pty. Ltd., adjacent to the Newcastle Steel Works, with a branch wire mill at Geelong, Victoria, 40 miles from Melbourne, and Lysaght Bros. & Co. Pty. Ltd. situated 5 miles from Sydney. Distribution facilities are excellent, the Newcastle and Geelong wire mills being on tidewater with shipping facilities to all Australian and overseas ports for distribution, and the sea transport of rods from Port Kembla to the Geelong plant. The Sydney wire mill is served by barge to ships side and road transport to railroad.

★ ★ ★

There is a small wire mill in Western Australia, whilst a few users draw very small quantities of wire for their own use.

★ ★ ★

Sydney and Melbourne, with populations of 1,900,000 and 1,600,000, are both well developed industrially, thus affording substantial markets adjacent to the wire mills.

★ ★ ★

Rylands Bros. (Australia) Pty. Ltd., Lysaght Bros. & Co. Pty. Ltd. and the associated Australian Wire Rope Works Pty. Ltd. are subsidiaries of the Broken Hill Proprietary Co. Ltd.

★ ★ ★

Fig. 1—Location of Steelworks and Wiremills in Australia.

For convenience the various companies are hereafter referred to as B.H.P., A.I.S., Rylands and Lysaghts. All references to weights and gauges are in long tons and Imperial Standard Wire Gauge.

Historical

The manufacture of Wire Nails, Barbed Wire, Wirenetting and sundry wire products commenced in the various states of Australia between 1884 and 1900, operating on imported wire.

★ ★ ★

The Austral Nail Co. Pty Ltd., of Melbourne, established by **James MacDougall** in 1887 to make Nails and later, Barbed Wire, was the first to produce wire when a small mill designed by the author commenced operation in 1911, using Continental rods.

★ ★ ★

Canada assisted in the starting up of this plant through the facilities afforded **R. M. MacDougall** to gain wiredrawing experience at Maritime Nail Co., St. John, New Brunswick, in 1910.

★ ★ ★

During the 1914-1918 war, output reached 300 tons per week off American rods. Production was all mild steel, mostly bright wire and black varnished annealed fence wire. Tinned, coppered and section wires were also produced in small quantities.

★ ★ ★

With the starting up of the previously mentioned B.H.P. rod mill in 1918, **James MacDougall,** at the request of the then Prime Minister of Australia, the **Honourable W. M. Hughes,** decided to establish a new wire mill at Newcastle to supply the greater part of Australia's requirements in steel wire.

★ ★ ★

The author returned from France late in 1918 to design and construct the new plant, visiting wire mills in Britain and America on the way. A start on site preparation, design and construction of buildings and machinery was made in January 1919 and production commenced in September of the same year. Products then made were confined to bright and annealed wires and black varnished fence wire, 40,000 tons being produced in the first twelve months. The next two years saw the introduction of galvanising and extension of the mill for a wider range of wire.

★ ★ ★

In 1921 Rylands Bros. Ltd. of Warrington, England, decided to produce Wirenetting in Australia on a site adjacent to the Austral Nail Co., which was to supply the wire, and in 1923 both Austral Nail Co. and Rylands Bros. Australian interests were amalgamated under the present title of Rylands Bros. (Australia) Proprietary Limited. The plant then operated under the joint management of **R. M. MacDougall, M. Howarth** and the author.

★ ★ ★

In 1925 the whole shareholding of the Company was purchased, and is now held, by the Broken Hill Proprietary Co. Ltd. There has since been continued expansion and modernisation of many sections of the plant.

★ ★ ★

Production of steel Fence Posts commenced in 1926 and continued on a small scale until 1937 when new buildings and equipment were installed, which has now an output of 650 tons, or 190.000 Posts, per week. Posts are of 'Y' section steel.

★ ★ ★

This Newcastle wire mill is very comprehensive in the range of wires made, since Australia uses practically every class of wire and they are all supplied by the one mill. Broadly, the range extends in size from 1″ to .007″ diameter in a carbon range from 1.3% to .03%. The use of 95 different analyses of steel and production of 800 different types of wire indicate the wide scope of operations. The plant is now producing over 2,000 tons per week of wire and wire products.

★ ★ ★

The author, **J. K. MacDougall,** was Manager from 1925 until retirement in 1952, when he was succeeded by **Frank Jenks.**

In 1953 Rylands established a branch wire mill at Geelong, Victoria, now producing 650 tons of bright wire per week. The layout provides for eventual extension to a comprehensive wire mill to produce all classes of bright, annealed and galvanised mild steel wires, wire products and steel fence posts.

★ ★ ★

Lysaght Bros. & Co. Pty. Ltd. commenced operations in Sydney in 1884 as a branch of John Lysaght Ltd. of England to make Wirenetting on a small scale. After a number of years the Company was reorganised under its present title, with Australian interests holding the majority of the shares, and the Wirenetting capacity was progressively increased.

★ ★ ★

Production of Barbed Wire, Wire Nails and Zinc Oxide commenced in 1910. Imported wire was used till 1915, when the author designed a small wire mill for production of nail wire from imported rods. With the availability of B.H.P. rods in 1918, the wire mill was greatly increased in capacity and extended in range to produce the full requirements of annealed netting wire and wire galvanising plants were also installed.

★ ★ ★

This growth of the company was in great measure due to **R. Champ,** General Manager from 1905 to 1942. He was followed by his son, **R. M. Champ,** who now occupies this position.

★ ★ ★

In 1929 the B.H.P. purchased, and now holds, the great majority of shares in the Company.

★ ★ ★

In 1949 a new modern wire mill was completed, some of the old equipment being retained for the time being.

★ ★ ★

The capacity is now 1900 tons per week of mild steel wire and wire products in a range of sizes from 5/8″ to 20 gauge.

★ ★ ★

Production has increased from

26,000 tons thirty years ago to the present 85,000 tons per annum.

The W. A. Netting & Wire Co. Ltd:

The W. A. Netting & Wire Co. Ltd. was established in West Australia in 1926 to produce Wire-netting, and added wiredrawing in 1930 and galvanising in 1937.

★ ★ ★

This plant produces about 70 tons of wire and 25 tons of Wire-netting per week.

The Australian Wire Rope Works Pty. Ltd:

The Australian Wire Rope Works Pty. Ltd., whose plant is situated in Newcastle adjacent to Rylands, was established in 1924 by four of the leading British wire rope makers and the B.H.P., and on the latter acquiring the British interests in 1935, became another B.H.P. subsidiary.

★ ★ ★

At first imported wire was used, but the Newcastle wire mill has supplied all requirements for many years past. All types of wire rope, except lock coil, from 2¾" diameter to fine aircraft control cord 1/16" diameter are produced with a maximum rope weight of 25 tons in one operation. The plant has a capacity of 13,000/15,000 tons per annum, sufficient for Australia's requirements.

Wire Products

Wire Nails and Barbed Wire are made in all States of Australia by a number of manufacturers, while many others specialise in such products as wire screen, springs, mattresses, steel wool, etc. These, together with a wide variety of practically every manufacture from steel wire, cater for Australia's requirements. Several of these firms date back from 1890 to 1910.

★ ★ ★

The A.R.C. Engineering Co. Pty. Ltd. operate factories in several Australian States, producing cross welded mesh for reinforcing and a wide variety of mesh transport containers, machine guards, safety mesh for roofs, galvanised welded field fencing and a special type of Barbed Wire.

★ ★ ★

This Company commenced operations in 1920 on imported wire, changing over to Australian made wire in 1924.

★ ★ ★

From an output of 1,500 tons in 1928, expansion has taken place over the years and productive capacity is now 35,000 tons per annum.

★ ★ ★

Cyclone Co. of Australia Ltd. are the principal makers of woven field fence and chain mesh, and also produce the whole of Australia's very considerable requirements of wire fly screen.

★ ★ ★

The Company commenced operations in 1898 and has progressively grown to an output of 18,000 tons wire products per annum.

★ ★ ★

Lincoln Electric Co. Aust. Pty. Ltd., E.M.F. Electric Co. Pty. Ltd. and Murex (A/sia) Pty Ltd. manufacture Australia's requirements of welding electrodes.

★ ★ ★

McPhersons Ltd. produce most of Australia's needs in bolts and nuts on a modern plant in a wide range, from common, to automobile and aircraft, qualities.

★ ★ ★

Nettlefolds Pty. Ltd. have factories in Melbourne and Sydney producing all types of wood and metal thread screws and other wire products.

★ ★ ★

The Automobile Industry with its recent great expansion in manufacturing in Australia uses a considerable quantity of wire in wide variety.

★ ★ ★

Practically the whole of the wire requirements of these manufacturers come from Rylands and Lysaghts wire mills, with occasional importations from overseas at times of temporary abnormal demand.

Wire Production in Australia

Having reviewed the circumstances leading up to present day conditions, it is proposed to now deal with plant and practice.

Rylands Newcastle Mill:

Location: The mill is situated on 32 acres of land adjoining the Newcastle Steel Works with railroad connections to the rod mill and B.H.P. tidewater wharves.

★ ★ ★

Layout: Fig. 2 shows the layout of the plant. Secondary processing is isolated from the wiremill to permit of rod storage being adjacent to the cleaning houses.

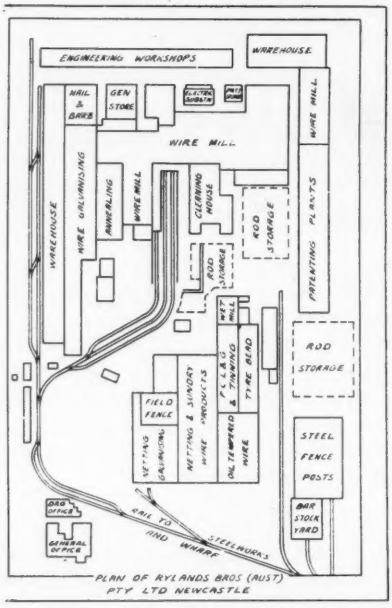


Fig. 2—Newcastle Wire Mill of Rylands Bros. (Australia) Pty. Ltd. ★ ★ ★ ★ ★ ★ ★

The plant has seen great expansion, not only in tonnage, but also in the variety of wires since the original installation, and this accounts for some lack in the co-ordination of certain departments, which, however, does not prejudice economic operations.

★ ★ ★

It is worthy of note that the plant and machinery throughout the mill, with the exception of a very few machines processing wire products, have been designed and

built by the Company in its own workshops, incorporating purchased equipment such as motors, switchgear and gear boxes.

★ ★ ★

Buildings: Buildings are generally of steel frame, walled with corrugated galvanised sheeting, the same material and asbestos cement being used for roofing. Relatively little heating is necessary for the winter, while adequate natural ventilation copes with summer conditions in the mild Australian climate.

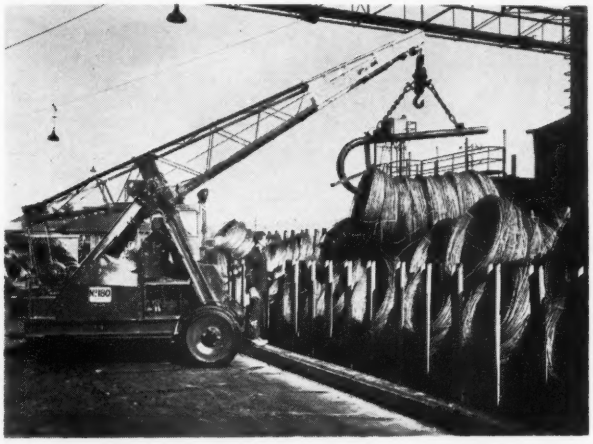


Fig. 3—Rod Handling at Newcastle.

Rod Handling: Rods arrive in stake sided rail trucks and are unloaded, stacked and delivered to the cleaning houses or patenting department by mobile cranes equipped with hairpin hooks. This installation, shown in Fig. 3, has been in use for 30 years and is due for replacement.

★ ★ ★

Cleaning Houses: The main cleaning house is a circular type range with a circular sulling frame and seven separate straight through alley bakers, typical of American design of 35 years ago, whilst a small auxiliary straight line cleaning house is used for pickling special steels and wire. This plant, while still satisfactory in operation, is obsolete and will shortly be replaced by a new unit similar to the type referred to later at Lysaghts Sydney and Rylands Geelong mills.

The cleaning capacity is 2,300 tons of rods in unit loads of 2,500 lbs., plus 300 racks of wire, per week.

★ ★ ★

Patenting: There are two patenting plants with open muffle type furnaces (Fig. 4) gas and oil fired and arranged for either air or lead quench, one for 5 gauge rods to 1/2″ dia. and the other, 7 to 12 gauge wire.

★ ★ ★

The throughputs per week are, 40 strand plant, 370 tons of 5 gauge rods and the 30 strand plant, 150 tons of wire.

★ ★ ★

Swifts are of double deck type (Fig. 5) and coils are welded, except lighter gauges of wire which are loop tied.

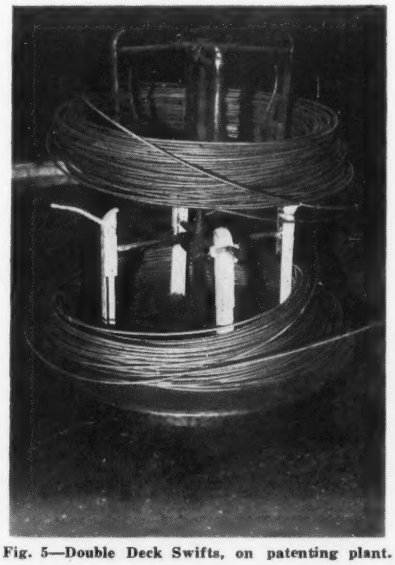


Fig. 5—Double Deck Swifts, on patenting plant.

★ ★ ★

Wires finer than 12 gauge are patented, cleaned, limed and baked or galvanised on a 30 strand plant (Fig. 6), the take up being on 600 lb. steel reels. This plant commenced operation in 1942 and was, it is believed, the first application of this principle.

★ ★ ★

Wiredrawing Plant: The original equipment comprised single hole benches with 27″ and 20″ blocks drawing 4/0 to 16 gauge wire at 450 f.p.m. and individual 2/3 hole belt driven machines for finer wires, these latter being scrapped 20 years ago.

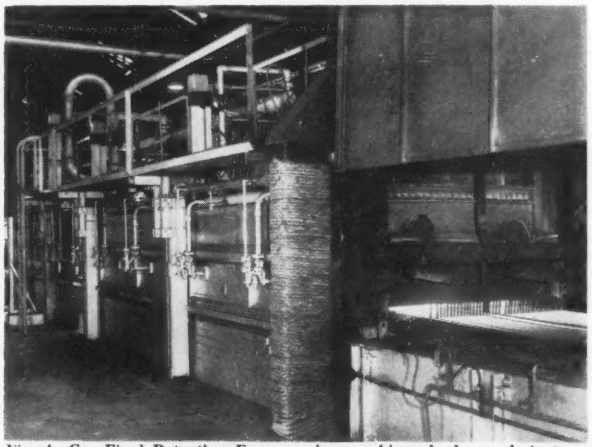


Fig. 4—Gas Fired Patenting Furnace air quenching; lead quench in foreground.

★ ★ ★

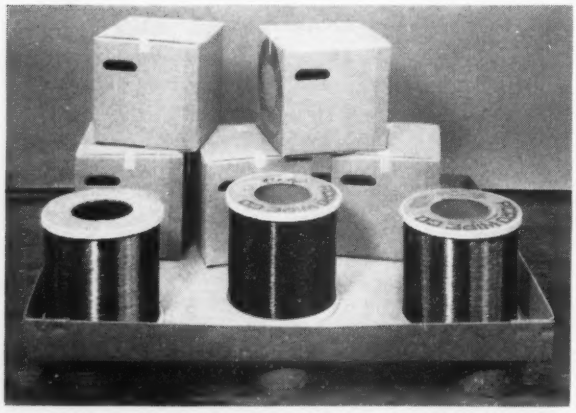
Since 1934 all new machines

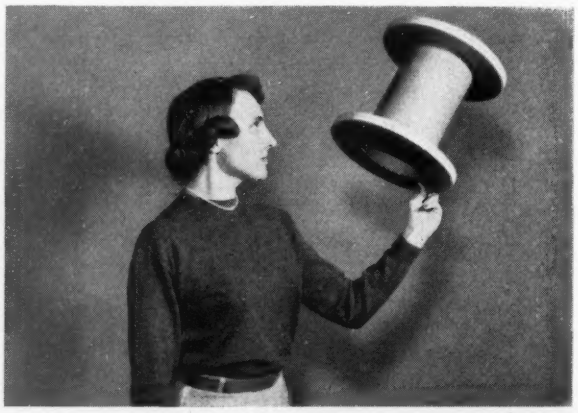
Fig. 6—30 Strand Plant combining patenting, cleaning; liming and baking or fluxing and galvanising.

Standing still

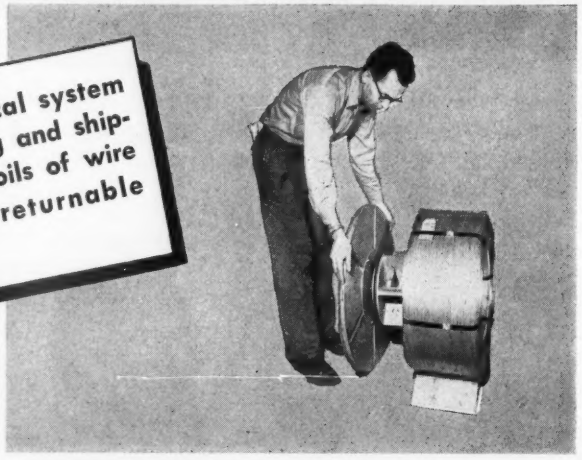
CONTINUOUS RESEARCH

First *First* in the field with a *practical* NON-returnable reel for low-cost packaging and shipping . . . adaptable to your present equipment.





AND a practical system for packaging and shipping heavy coils of wire in a NON-returnable package.



We make and sell the demountable head-reel fixtures for let-off and take-up required for processing this big package. Also the equipment for handling the coils.

IMPORTANT

We invite you to see these **ACROMETAL** products on display at our Suite, Hotel Penn-Sheraton, Pittsburgh Convention—October 29-November 1

doesn't suit our temperament

HELPS US TO HELP YOU DO A BETTER PACKAGING JOB. ★ NOTE THESE ACROMETAL IMPROVEMENTS IN WIRE PACKAGING.

First to develop a spool with the head being an *integral part* of the barrel — thus eliminating wire entrapment. A truly lightweight *precision* spool — accurately balanced for high speed operation.

First to build a precision heavy duty steel shop spool with *hardened flanges* to resist rough treatment and abuse . . . practically eliminating nicking and bending.

First to produce a line of lightweight Heavy Duty Aluminum Shipping Reels — precision-machined from tough aircraft alloys to stand hard service.

Leadership always stems from a state of mind. We don't like to stand still. We are forever working on new ideas, trying new processes, testing new materials. In that direction lies progress . . . and a better product . . . so that you in turn can do a better packaging job — faster, with less trouble, at lower cost.

ACROMETAL PRODUCTS INC.

616 5th Street North, Minneapolis 1, Minn.

have been the continuous type and three of the old benches will shortly be replaced by this type. The other three benches will be retained for some time, principally for single holed wire and supplementing the heavy continuous machines when necessary, for drawing the larger spring and rope wires. Two of these benches are driven by 250 h.p. A.C. variable speed commutator type motors, which have given over 25 years satisfactory service.

★ ★ ★

Three heavy blocks cater for bolt, chain and other heavy rounds and sections up to 1" diameter.

★ ★ ★

All continuous machines are of the accumulation type, not because this is considered to have any particular merit over straight through machines but rather that, having started on this principle, uniformity of type is some advantage to operators.

★ ★ ★

It is considered that the cooling of the accumulation between drafts is advantageous, particularly for high carbon wire drawn at high speeds.

★ ★ ★

Finishing die boxes are adjustable vertically, horizontally and for angle of die to wire.

In 1933 one 10 and two 8 hole continuous machines were designed and built finishing 20 gauge at 1,400 ft. and 18 gauge at 1,000 ft. per minute from 5 gauge low carbon rod. The success of these machines led to the further installation in 1937 of three 9 hole machines finishing 18 gauge from the rod at 2,750 f.p.m. These are shown in Fig. 7. This was probably far in excess of production speeds elsewhere at the time, and is well up to present day practice. These high speed machines are equipped with variable speed A.C. commutator motors with worm and spiral bevel drives to the blocks.

★ ★ ★

And now for a comment which may provoke some discussion.

★ ★ ★

This type of motor has given outstanding service for many years, its only disadvantage being high initial cost. This is, however, largely offset by the lower cost of the simple control gear, requiring only one contactor and a brush shifting pilot motor for each prime mover, while a simple push button control pulpit at the finishing block and individual block foot pedals afford very convenient operation and perfect control over accumulation of wire on intermediate blocks. This centralised control at the finishing block saves much operator's time and movement and is general practice in the three wiremills for all types of motors, whether commutator A.C., pole changing induction A.C. or D.C. motors.

★ ★ ★

Provided a wiredrawing machine is designed for a reasonable range of finished product, A.C. variable speed commutator motors are, in the author's opinion, preferable to D.C. equipment with its much more elaborate control, motor generators or rectifiers, etc. all requiring regular attention and maintenance. It is only where the range is unduly great, as for example, finishing say 16 gauge at 1,000 f.p.m. and 20 gauge at 2,000 f.p.m. on the same block that the usual constant torque characteristics of the A.C. commutator motor would not meet horse power requirements for the heavier wire unless unduly large motors are installed.

★ ★ ★

Thirty-seven 17 h.p. motors of this type have been in continuous 24 hour operation at Newcastle for close on 20 years, with commutator performance at least equal to that of good D.C. machines, while maintenance of control equipment is negligible due to its simplicity. Each of these motors has gone through the 3 to 1 speed range over half a million times with very little upkeep of the brush shifting gear, the pilot motors providing automatic stepless acceleration. They are, however, more susceptible to heating from dust collection in the windings than other types of motor, but provision to avoid this is a simple matter. It will be seen from the various illustrations that fresh air forced ventilation of motors is generally adopted.

★ ★ ★

Will the advocacy of this type of motor provoke discussion on the merits of various types for wiredrawing?

★ ★ ★

The 1939 war necessitated a change over to motors of a type manufactured in Australia, consequently subsequent machines were then, and have since been, fitted with 2, 3 and 4 speed squirrel cage induction motors. These

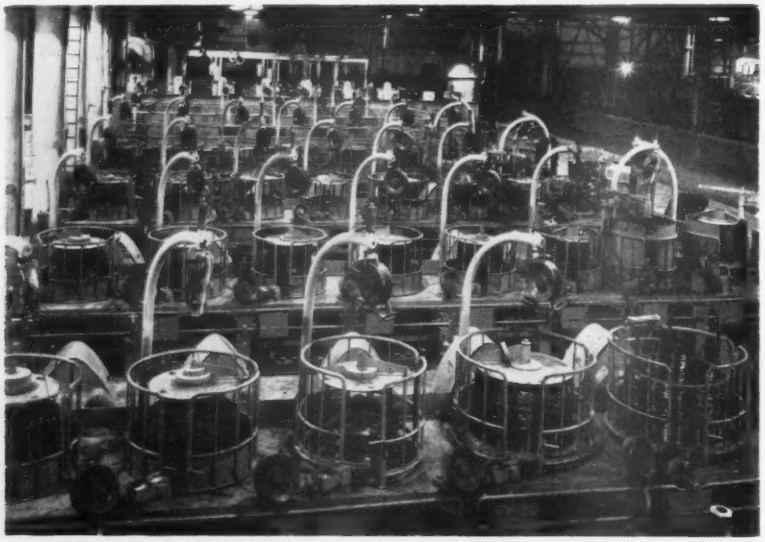


Fig. 7—Part of Wire Mill showing high speed wiredrawing machines, 2750 f.p.m. * * *

motors by their stepped speeds avoid too sudden acceleration and permit reasonable control of accumulation on intermediate blocks and have the merit of being conveniently designed for maintenance of full horse power at 3/4 speed with corresponding maintenance of torque at lower speeds.

★ ★ ★

High speed finishing blocks are fitted with circular hoods, which are pushed up the block pins by the accumulating coil. These will be clearly seen in Fig. 8. When the hoods reach a predetermined height they operate full coil cut outs, thus stopping the machines. For quick stripping, the hoods are lifted and swung aside by pneumatic davits. These hoods are of great merit when drawing large coils at high speeds, giving a good shaped coil and avoiding any tendency of the wire to rise over the pins.

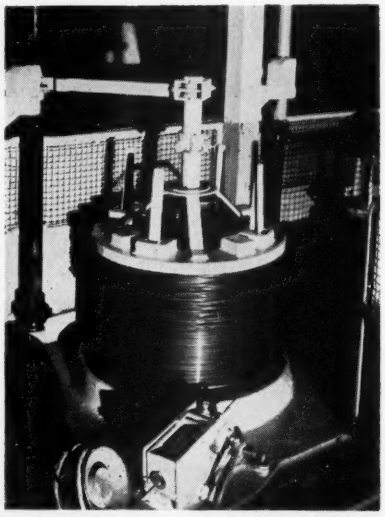


Fig. 8—Finishing Block Coil Retaining Hood, air lift for hood and full coil cut out. * * * *

The continuous machine equipment now comprises:

Three 9 hole and two 5 hole, finishing 18 to 20 gauge low carbon at 2750 and 2500 f.p.m respectively off rods and wire, the 5 hole machines being fed from 2000 lb. coils of wire.

Nine 5 and 6 hole, finishing 12 to 16 gauge off rods and wire, high and low carbon, with finishing speeds from 600 to 1750 f.p.m according to product drawn.

Two 7 hole, finishing 15 to 17 gauge off rods, high and low carbon at 2000 f.p.m.

Fourteen 7 and 8 hole, finishing 17 to 24 gauge high and low carbon off wire at 800 to 1400 f.p.m.

Fifteen 7 and 9 hole, finishing 26 to 36 gauge, high and low carbon off wire, at 1000 to 2500 f.p.m.

Three 6 hole Marshall Richards D.C. motor driven accumulation type machines, the first not designed and built on the plant, have just been installed with finishing speeds variable between 1000 and 2000 f.p.m to finish 16 to 20 gauge high carbon. These incorporate special features to Rylands' requirements, particularly in respect of special water cooling of the blocks, guards and electrical control.

★ ★ ★

Particular attention is paid to feed in and stripping of all continuous machines with the result that, for example, finishing blocks of 2,750 f.p.m. mild steel machines are stopped for only 45 seconds for stripping.

★ ★ ★

It has been Rylands practice for many years to enclose wiredrawing blocks within guards (See Figs. 7 & 9), which rotate or swing out for access to the blocks. These guards are electrically interlocked so that a block can only run at a slow draw-in speed when a guard is open. It is interesting to note that world practice has recently moved in the direction of this desirable safety feature.

★ ★ ★

Importance is attached to effective block cooling, water being used, and the more recent machines are particularly effective in this respect, due to very large and thin internal finning of the blocks and good distribution of the water sprays. The problem of water throwing from the skirt of the block at high speeds when a large volume is used has been very successfully solved in the design of the block skirt and surrounding ring.

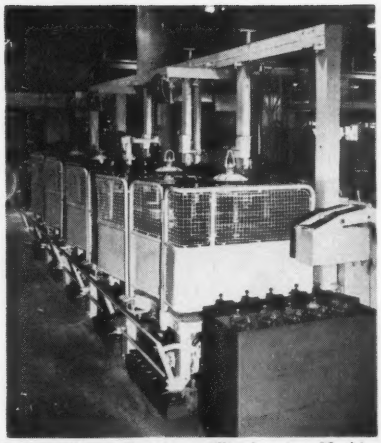


Fig. 9—Hinged Guards on Wiredrawing Machine.

★ ★ ★

A number of machines are fitted with 600 lb. reeling equipment for wire required for subsequent processing.

★ ★ ★

Fig. 11 shows the twin rod flipping stands used for feeding most of the continuous machines, whilst Fig. 12 illustrates an interesting combined device which by reversing on its base may be used as required for feeding the wiredrawing machines from either reels or

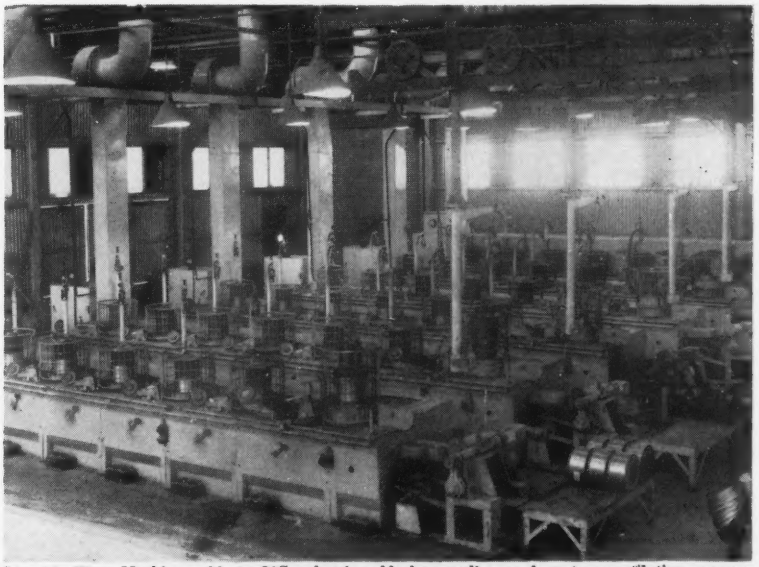


Fig. 10—Fine Machines, 26 to 36G, showing block guarding and motor ventilation system.

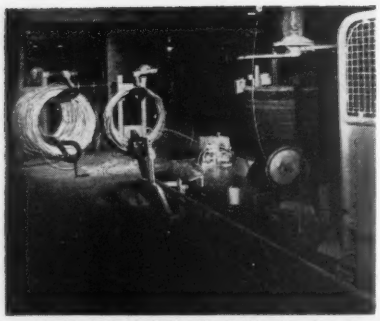


Fig. 11—Twin Rod "Flipping" Stands. * * *

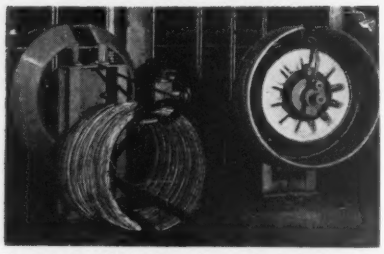


Fig. 12—Combined Dereeling and Decoiling Device. * * * * * * * * * * *

coils of wire.

★ ★ ★

Fig. 13 shows the last block of a 5 hole continuous machine finishing a 2,000 lb. coil of 13G wire at 1880 f.p.m. In Fig. 14 is seen the dewinding of one of these 2,000 lb. coils used to feed 5 hole continuous machines finishing 17 to 20G wire.

Fig. 13—Finishing 2000 lb. Coil, 13G at 1880 f.p.m. * * * * * * * * * * * *

Section wires are cold rolled or drawn through Turks Heads, rolls or T.C. dies according to type.

★ ★ ★

Annealing: The annealing equipment of coke fired pit type, carrying up to four pots per pit, has been in service for many years and will shortly be replaced, at least in part, by modern equipment and therefore calls for no particular comment, except that it has the merit of low cost equipment suitable for common mild steel wire. A gas fired furnace is used for special annealing.

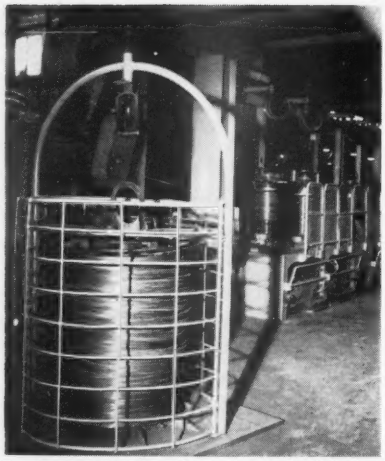


Fig. 14—Dewinding 2000 lb. Coil, by "flipping" off. * * * * * * * * * * * *

★ ★ ★

Wire Galvanising: 3 to 16 gauge wire is galvanised on two 40 and one 30 wire plants. These are of conventional design, wire being stripped from the running take up blocks in coils of up to 500/600 lbs. weight (Fig. 15). Zinc and lead baths are gas fired under automatic control.

★ ★ ★

Tyre Bead Wire: By arrangement with National-Standard Company, Niles, Mich., a plant was installed in 1948 and produces Australia's requirements of A.P. type Tyre Bead Wire.

★ ★ ★

Finishing Departments: Twenty-six looms for hexagon mesh netting in ½" to 4" mesh have a capacity of 300 miles per week (Fig. 16). All netting is galvanised subsequent to weaving, the greater part being in 1¼" and 1½" mesh rabbit and 3" and 4" dog netting for these two Australian pests.

★ ★ ★

A considerable number of straightening and cutting machines, coil winders, etc. process wire for various purposes.

★ ★ ★

Nails, Barbed Wire and Field Fence are only made in small quantities because wire is supplied to other makers of these products. The machines are of conventional American and Continental type.

★ ★ ★

Tungsten Carbide Dies: The introduction of these dies in 1929 rapidly replaced chilled cast iron dies for the heavier, and cold battered wortles for the finer gauges.

★ ★ ★

Before the war, British and American T.C. dies were used but owing to the uncertainty of supplies under war conditions, the B.H.P. produced sintered nibs in 1942. This was an interesting development as B.H.P. metallurgists had no prior experience nor assistance from overseas makers, yet very quickly produced nibs of high quality from Australian ore.

★ ★ ★

Rylands carry out all mounting and finishing of the dies and supply all wiredrawing dies for their own and associated wire mills as well as round and section dies up to 2⅝" diameter for tubing, shafting and section bar drawing. Numerous other forms of T.C. tools are produced for various wire working requirements.

★ ★ ★

Fence Posts: 'Y' section bars are delivered by railroad from the Steel Works and processed through two sets of heavy cutting, pointing and punching presses, being subsequently bundled and coated with hot tar prior to shipment (Fig. 17).

★ ★ ★

Internal Transport: Mill trucks drawn by tractors and lift trucks of 4,000 and 6,000 lbs. capacity equipped with "rams" convey rods to wiredrawing machines and wire to warehouse and processing departments.

★ ★ ★

Workshops: A foundry, structural and machine shops, electrical department and workshops for the

Fig. 15—Galvanising Plants for 40 wires. * * * * * * * * *

Fig. 16—Hexagon Mesh Netting Looms, general view. (at right) * * *

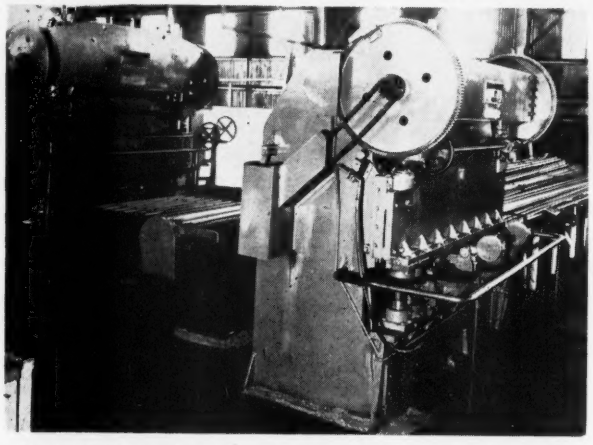


Fig. 17—Steel Fence Post Presses. * * * * * * * * * * *

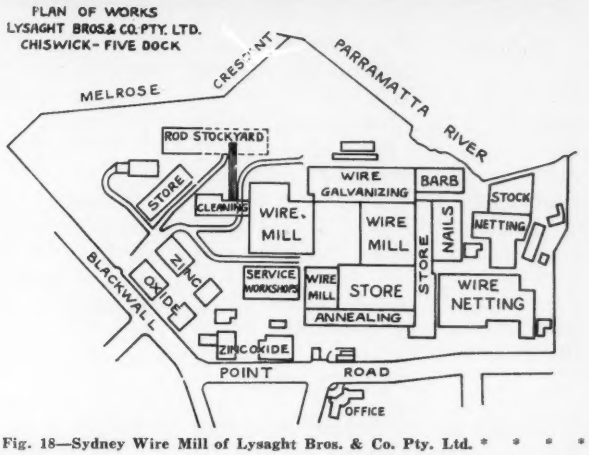


Fig. 18—Sydney Wire Mill of Lysaght Bros. & Co. Pty. Ltd. * * * *

various other trades are equipped to build and maintain all sections of the plant.

Lysaght Bros. & Co. Pty. Ltd:

Location: The plant is situated on the banks of Parramatta River five miles from Sydney with road and water transport to city wharves, railroad and warehouses. Production is confined to mild steel wires and wire products.

★ ★ ★

Layout: The progressive growth of the plant having resulted over the years in some lack of coordination of departments, modernisation is proceeding, the first step having been a completely new wire mill unit completed in 1949. (Fig. 18.)

★ ★ ★

Rod Handling: Rods arriving by road are unloaded and stacked six high in bins by overhead crane equipped with two independent lifts and hairpin hooks (Fig. 19). This feature greatly reduces crane travelling time.

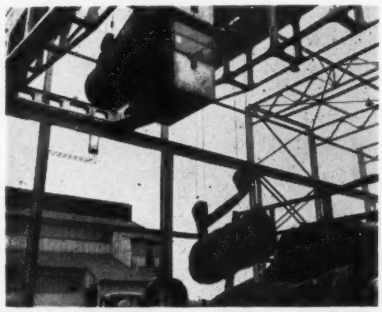


Fig. 19—Rod Handling and Storage at Sydney.

Rods are conveyed in unit loads of 3,360 lbs. of 280 lb. and 4,365 lbs. of 485 lb. rod bundles by inclined tramway into the cleaning house.

★ ★ ★

Cleaning House: The cleaning house is of double line type, acid and wash tubs on one side and lime tanks and bakers on the other.

An overhead travelling crane, with the control cabin at floor level for the operator's convenience, serves the department, taking loads from the transfer trucks, through the cleaning cycle to the wire mill floor. A telescopic frame attached to the crab of the crane prevents rope swinging. Lift "ram" trucks transport cleaned rods from the crane delivery point to the wiredrawing machine.

★ ★ ★

Acid baths, directly heated by steam, are of steel with brick lining protecting the bitumastic and acrilic linings.

★ ★ ★

Each baker holds one unit cleaning load and is heated by recirculation of hot air provided by a coal fired heat exchanger, the crane driver controlling operation of the baker doors and the measuring and feeding of acid to the cleaning tubs from the cabin of the crane.

Fig. 20—Reversible Rod "Flippers," and motor ventilation system. * *

Fig. 21—Finishing End Wiredrawing Machines, showing stripper cranes and switchboard gallery. * * * * * * * * * * * *

Wire Mill: The wire mill is a lofty steel framed building with all electrical control gear carried on galleries. The motor ventilating system is carried overhead to avoid any obstruction at floor level (Figs. 20 & 21).

★ ★ ★

All machines are of the continuous accumulation type and comprise: Six 3 and ten 5 hole, drawing from 5 gauge rods.

★ ★ ★

Several of the 5 hole machines are fitted for finishing on 5000 lb. reels (Fig. 22), which feed six 5 hole machines finishing 17 to 20 gauge in ordinary or formed cheese shaped coils for netting weaving.

★ ★ ★

Very effective dewinding of the stationary 5000 lb. reels is effected by unlaying arms which are attached to the centre of the reels (Fig. 23). The frame carrying the reels is pivoted so that one reel may be loaded while another is feeding the machine.

★ ★ ★

Wiredrawing speeds are 1500 f.p.m. for 5 hole from rod, while the light machines finish at 2500 f.p.m. All motors are pole changing induction type. Individual block operating pedals and centralised control pulpits are provided.

★ ★ ★

Rods heavier than 5 gauge are drawn on old single hole benches which will soon be replaced by modern high speed blocks, individually motor driven.

★ ★ ★

All wiredrawing equipment, old and new, has been built locally to Lysaghts and Rylands design. Tungsten carbide dies are used throughout.

Wire Galvanising: Three 26 and one 30 wire plants are installed, all producing "wiped" wire. Three plants turn out 700 tons per week, one being kept in reserve against bath failures. Lead and zinc baths are oil fired.

★ ★ ★

Wire Products: The wirenetting plant has a capacity of 300 miles per week but operates below capacity, in some measure due to the reduction in the rabbit pest through the introduction of myxomatosis, a parasitic disease destroying the rabbits.

★ ★ ★

The capacity for Barbed Wire and Nails is 180 and 150 tons per week respectively but these departments do not operate fully since, like Rylands, wire is supplied to other makers of these products in various parts of Australia.

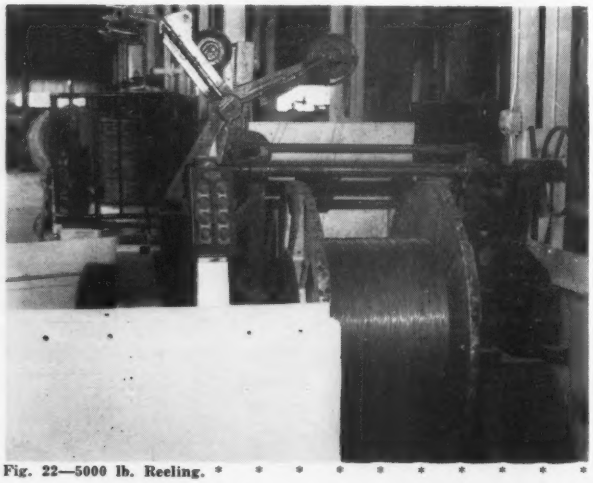


Fig. 22—5000 lb. Reeling. * * * * * * * * * *

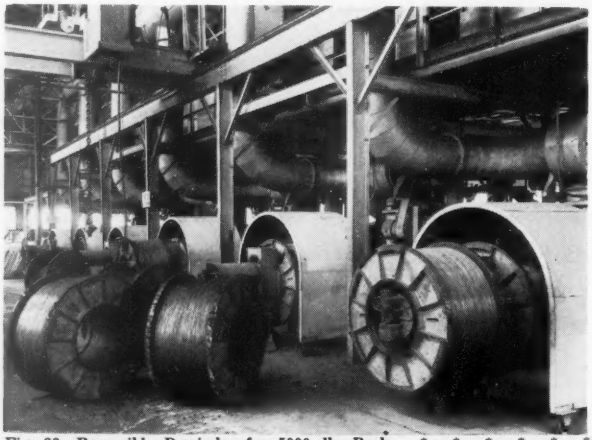


Fig. 23—Reversible Dewinder for 5000 lb. Reels. * * * * * * *

Internal Transport: Lift trucks with "rams" are used for all transport in the wire mill, processing departments and the warehouse.

Rylands Geelong Mill:

Production of bright mild steel wire commenced in 1953 with a range of sizes 5/8" to 15 gauge to supply Victorian manufacturers with bolt, reinforcing, nail, electrode and other bright mild steel wires.

★ ★ ★

The mill building is steel frame, corrugated iron sheeted, saw tooth construction, 120 ft. clear span with 16 ft. rise of the saw tooth affording excellent natural lighting.

★ ★ ★

Rod Handling: At the A.I.S. rod mill in New South Wales the coils are compressed into approximately 4000 lb. bundles and securely tied. These become the unit load for the Geelong cleaning house.

★ ★ ★

This bundling greatly facilitates loading and unloading, with resultant quicker turn round of ships than would be possible with loose coils.

★ ★ ★

The discharge wharf is adjacent to the wire mill, thus ensuring convenient handling of rods from ship to rod stockyard. Both overhead craneway and open yard stacking with "ram" lift trucks are used, rods being fed into the cleaning house by transfer trucks.

★ ★ ★

Cleaning House: While this is generally similar to Lysaghts, the bakers perhaps warrant reference to a special feature (Fig. 24). They also are loaded from the top by crane through sliding doors and hot air entering at one, and leaving through the other end of the baker, is recirculated from a heat exchanger. Under each baker is a fan of 13,500 cub. ft. per minute capacity, which draws air from one side of the baker and returns it to the other without interfering with the steady flow of hot air into and from the baker, thus setting up a violent turbulence within the baker (Fig. 25). The flow of hot air and operation of the turbulence fans is controlled automatically by the movement of the top doors.

★ ★ ★

Wire Mill: The installation comprises two single hole 4 speed heavy blocks finishing up to 1000 f.p.m., two 3 and two 5 hole machines, similar to Lysaghts, finishing at 1500 f.p.m. Provision is made to strip on any of the last two and three blocks.

★ ★ ★

Electrical control gear is carried on a central overhead gallery affording very convenient access.

★ ★ ★

Internal transport is by "ram" truck and finished wire is despatched by road.

Productive Capacity of Australian Wiremills

The three wire mills are operating close to full load but the wire processing departments have spare capacity in several products.

Wire productions per week of 120 hours are at present averaging:

Rylands Newcastle: Over 2000 tons of:
Bright, Annealed, Galvanised and Tinned Mild Steel Wires
Rope, Spring and other high carbon wires, bright and galvanised
Small quantities of various alloy steel wires

Lysaghts Sydney: 1750/1850 tons of:
Bright, Annealed and Galvanised Mild Steel Wire

Rylands Geelong: 600 tons of:
Bright Mild Steel Wire

★ ★ ★

The total Australian wire production of about 225,000 tons per annum is approximately one tenth the ingot tons steel production of the two Australian Steel Works.

Australian Wire Mill Practice

The following outline of practice is general in all three wire mills as regards mild steel, but all references to patented and other high carbon wires and alloy steels apply only to Rylands Newcastle mill where these products are made.

★ ★ ★

While replacement of older equipment still in use will be implemented in the near future, the next phase, and an important one, is the finishing of wire in large coils or reels for further processing, unitising loads of wire for market, and further improvements in internal transport and warehousing, together with associated modifications of plant layout.

★ ★ ★

Such items as equipment for finishing in heavy coils and, or,

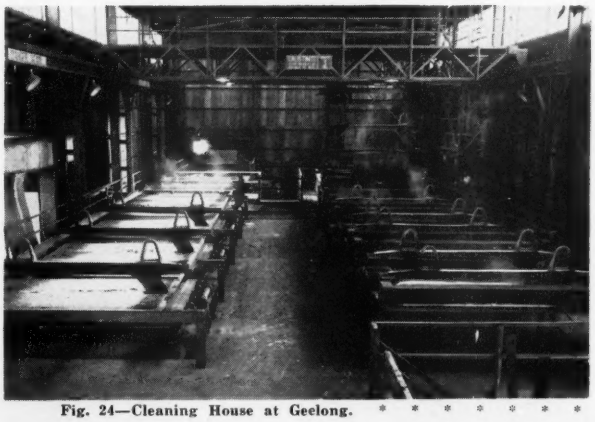


Fig. 24—Cleaning House at Geelong.

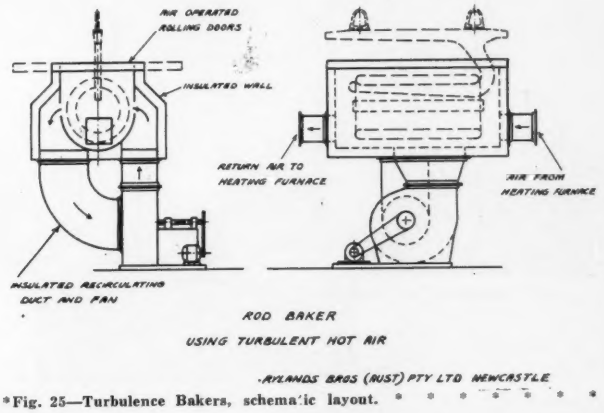

AIR OPERATED ROLLING DOORS
INSULATED WALL
RETURN AIR TO HEATING FURNACE
AIR FROM HEATING FURNACE
INSULATED RECIRCULATING DUCT AND FAN
ROD BAKER
USING TURBULENT HOT AIR
RYLANDS BROS (AUST) PTY LTD NEWCASTLE

*Fig. 25—Turbulence Bakers, schematic layout.

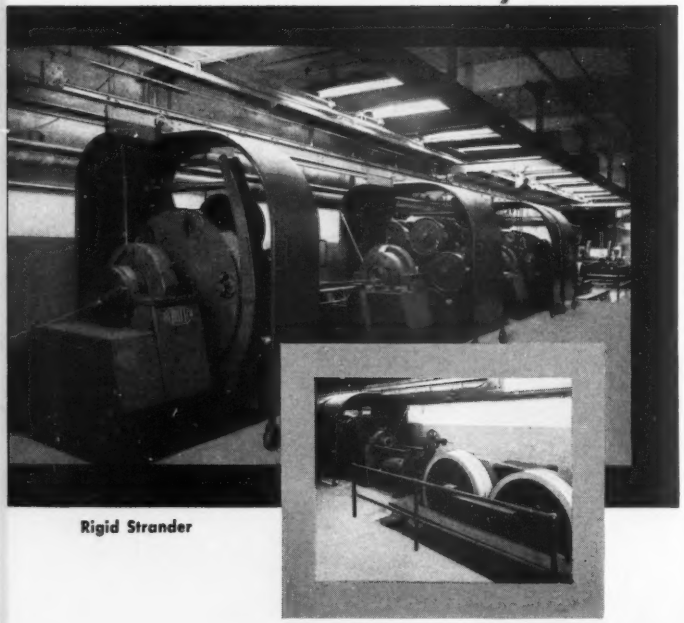
NEBUTTCO

MACHINERY

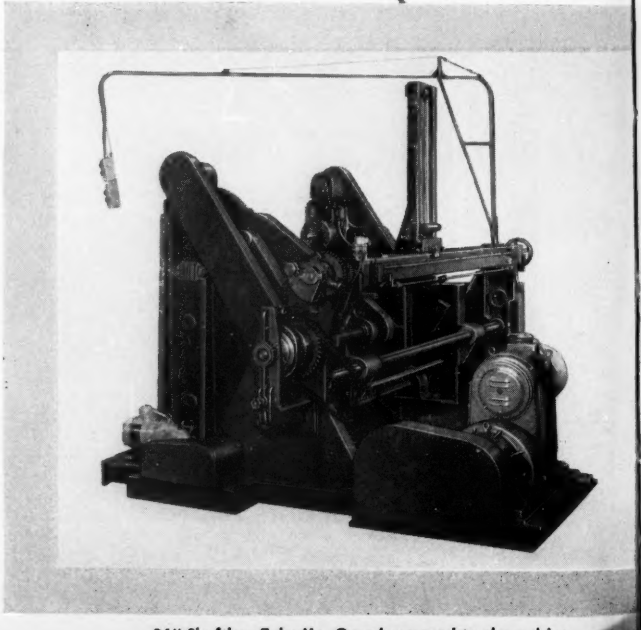
for high speed p

of cables, strands and i

Fast and reliable, Nebuttco Equipment is the last word in wire making machinery — ideal for profitable production of cables or strands, bare or insulated. Ask for information and literature.

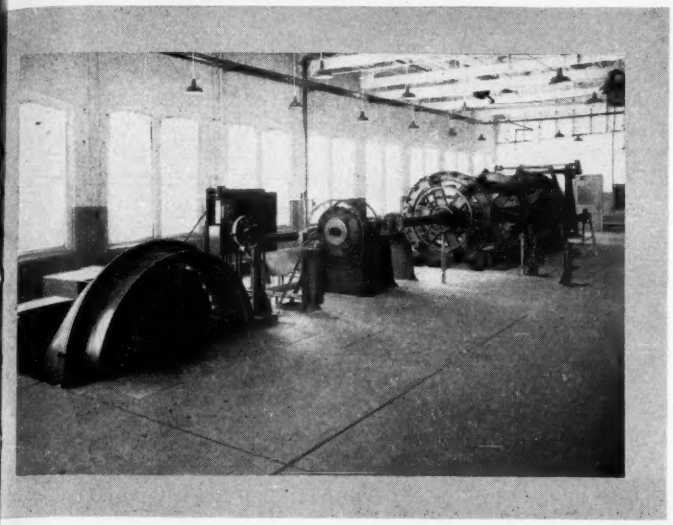


Rigid Strander

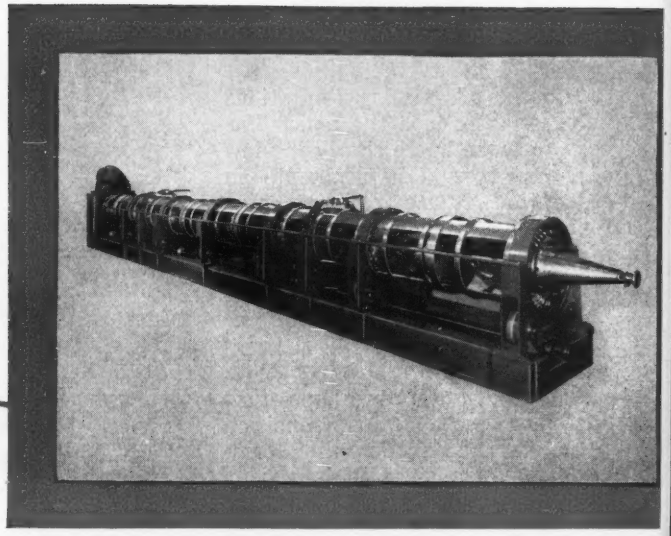


96" Shaftless Take-Up. Guard removed to show drive

7-strand Planetary Closer, for 60" x 48" reel



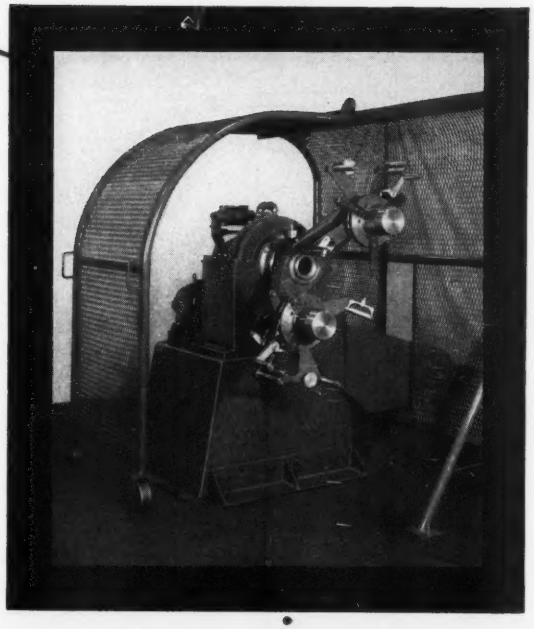
12-Wire Tube Strander

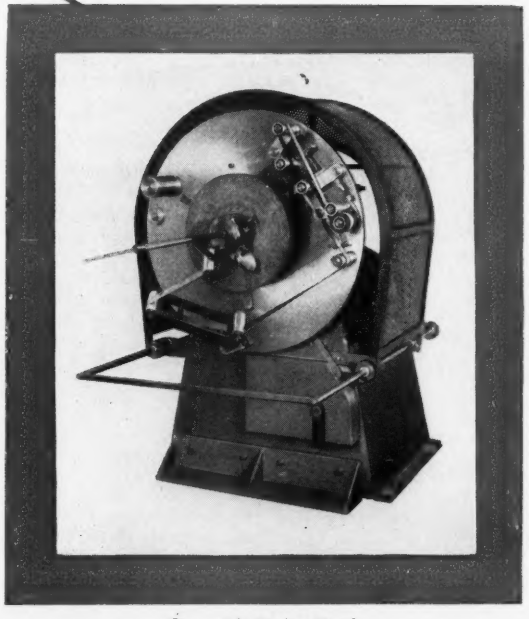


production

insulation

Eccentric Taping Head





Concentric Taping Head

BRAIDERS
CABLERS
TAKE-UPS
BUNCHERS
STRANDERS
TAPING MACHINES

New England Butt Co.

Division Wanskuck Company

304 Pearl Street · Providence 7, R. I.

In **ENGLAND** — James Day (Machinery) Ltd., 28 Maddox Street, London, W-1.

reels, new take up frames for patenting, galvanising, etc., which are under review at the present time, may be regarded more as material handling than as production equipment, and it is probably handling rather than production that offers the greater scope for future reduction in costs.

★ ★ ★

In spite of existing limitations in these directions the policy has been to make haste slowly in view of more recent developments in order that future planning may represent an overall step forward in order to achieve that complete coordination of operations so necessary for efficient production and handling.

★ ★ ★

The author therefore hopes that due allowance for this transition period will be made when comparing Australian with American practice.

★ ★ ★

It is perhaps also appropriate to mention the relatively small scale of operations and the fact that, as regards special wires, Australia uses practically every variety of steel wire, all of which have to be made in the one wire mill, often in small quantities.

★ ★ ★

Cleaning: Sulphuric acid pickling baths are made up to approximately 7% mono acid. Acid additions are made and tubs later worked down and discharged when iron contents reach 100 gm. per litre and acid falls to 2%. Acid consumption averages 37 lbs. mono acid per long ton pickled. Bath temperature is maintained at approximately 180°F. by direct steam heating. Baths are made up with hot water to minimise down time.

★ ★ ★

Hot or cold lime or hot borax are used for coating as required.

★ ★ ★

Reference was made earlier to the high turbulence bakers at Geelong and a comparison of the effect of high and low air movement indicates the merit of this system.

★ ★ ★

Relative drying times for 4000 lb. of wet limed rods are:

With turbulence fans running . . . 6 to 10 minutes
With turbulence fans stopped . . . 30 minutes

★ ★ ★

In each case the volume of recirculated hot air passing through the baker is 6600 cub. f.p.m. entering at 350°F.

★ ★ ★

Patenting: Examples of practice on the two muffle type furnaces are:

No. 1 Plant: 45′ 0″ furnace, 40 blocks with a range of ½″ to 5G. The full number of blocks are not used on the heavier sizes.

Average throughout per week (120 hours), 320 long tons

Typical speeds of travel—

⅜″ 6.3 f.p.m.
5G 23.3 f.p.m.

Temperature of rods leaving furnace 980/1000°C (1796/1833°F) and of lead quench, 540/550°C (1004/1022°F)

No. 2 Plant: 57′ 0″ furnace, 30 blocks 7 to 12 gauge.

Average throughout per week 150 tons, 10G, for example, travels at 35 f.p.m.

Combined Plant: The in line patenting, cleaning, liming and baking or cleaning and galvanising plant has 30 blocks with an average throughput of 95 tons per week.

★ ★ ★

Typical speeds of this plant are:

Gauge	Liming & Baking f.p.m.	Galvanising f.p.m.
12	37.6	71
14	63.6	83
18	100.0	100

Temperatures are:
high temperature
lead kettle 850°C (1562°F)
lead quench 550°C (1022°F)

An agitated gravel bed in the water wash following pickling is very effective.

Adequate and quick baking of the travelling wires is ensured by a high velocity flow of recirculated hot air in a short tunnel. Air blast curtains at each open end prevent any appreciable loss of hot air.

Speeds on the patenting plants are limited by existing furnace conditions, which are under review at the present time.

★ ★ ★

Wiredrawing: Reference has been made to further development of large coils and reels for processing, while market coils are supplied in the largest weights acceptable to buyers. In 14 gauge and larger the latter vary from 280 to 500 lbs. for the general run of wire and up to 900 lbs. for larger sizes of bolt wire.

It will have been noted in the details of plant that development of continuous machines has been in the direction of higher speeds, but it is felt that further increases may be tempered by the very high cost of high speed machines due to greater ruggedness and the greater complexity of controls, cut outs etc. necessary to achieve efficiency at very high speeds.

★ ★ ★

Great importance is attached to the ancillary gear for feeding, welding, and stripping since on these depend the productive efficiency of the wiredrawing machine itself.

★ ★ ★

At Newcastle, for example, where rod coils are 280 lb., the welding of rods occupies considerably more time than all other wiredrawing operations combined.

★ ★ ★

The accompanying views show some features of equipment developed for rod and wire feed and stripping the finishing blocks.

★ ★ ★

Typical finishing speeds on recent machines are:

Mild Steel

Size	Finishing speed f.p.m.	Finished Wire
¾″	100	Coils (single holed)
⅜″	300	″ ″ ″
5G	900	″ ″ ″
13G	1880	500 and 2000 lb. coils
12 & 14G	1500/1750	500 lb. coils & 5000 lb. reels
19 & 20G	2500/2750	Coils & 100 lb. formed "cheese" coils
31G	2500	Coils & 80 lb. reels

★ ★ ★

The 2000 lb. coils and 5000 lb. reels are for redrawing and have so far been applied only to a limited extent.

★ ★ ★

The majority of feed for redrawing, galvanising, etc. is still in 500/850 lb. coils or 600 lb. reels.

★ ★ ★

Patented High Carbon Rope Wire to 110/120 tons sq. inch & Spring Wire:

Gauge	Finishing speed f.p.m.	Finished Wire
9	750	Coils
14	1050	"
20(x)	1300/2000	Coils & 600 lb. reels
30/36	2000	Coils & 80 lb. reels

(x) 20G 140 tons sq. in. is drawn at 2000 f.p.m.

★ ★ ★

600 and 80 lb. reels are for further processing and the latter are also supplied as feed to the Wire Rope Works.

★ ★ ★

The redrawing of wire after hot galvanising is standard practice for all rope wire 16 gauge and finer, and this wire after 7 holing complies with the requirements for fully galvanised wire. Speeds, lubricant and other wiredrawing factors are in principle the same as for bright wire.

★ ★ ★

Wire Galvanising: Wiped Wire Practice—lead bath for annealing and also used at low temperature for burning the soap coating on hard wire to facilitate subsequent pickling in hydrochloric acid. Hot ammonium chloride flux tank prior to entering zinc. Screw down wipers with asbestos rope pads. Wire is water quenched immediately on leaving wiper. Take up is on conventional winding frames.

★ ★ ★

Representative wiping speeds are 8 gauge 65, and 12 gauge 113 f.p.m. and a 40 wire plant averages 530 and 410 tons per week respectively. Production on the finer gauges is restricted by the maximum speed at which a running block can be safely stripped and modifications to eliminate this disability are at present under review.

★ ★ ★

Fully galvanised wire follows the same practice up to the zinc bath which it leaves vertically through a bed of oiled charcoal. A water quench is applied at appropriate heights above the zinc with resultant very heavy coating suitable for subsequent long hole drawing. Correct design and application of this water quench ensures a concentric zinc coating.

★ ★ ★

The Crapo cyanide process is applied to the heavier sizes of soft mild steel wire at the lead bath, as required.

★ ★ ★

The production of fully galvanised wire on a 40 wire plant averages 8 gauge 240, and 12 gauge 150 tons per week.

★ ★ ★

Tinned Wire: A 30 wire tinning plant averages 30 tons 23 gauge wire per week and comprises a straight line range comprising hydrochloric acid cleaning, water wash, flux and tin, take up being on 18" dia. vertical blocks. Hard rubber pads are used for wiping the wire leaving the tin.

★ ★ ★

Tyre Bead Wire: Production follows National Standard Co. practice and does not call for comment except perhaps the despooling gear for 600 lb. reels, designed by Rylands, which is very effective in maintaining a steady feed, free from any tendency to snatch or over run.

★ ★ ★

Oil Tempered Wire: A small plant covers a range of 7 to 18 gauge with lead heating, oil quench of the straight through oil overflow type, lead tempering, oiling and coiling on conventional take up frame.

★ ★ ★

Wire Products: There are no special features associated with the production of wirenetting of the two twist type. Reverse twist netting is not made. After weaving all netting is galvanised continuously at a uniform speed, provision being made for looping the netting while changing rolls in the winding frames. Netting woven from galvanised wire is not acceptable to the Australian market, users requiring long life and a minimum of upkeep both for the very extensive fencing for protection against rabbits and wild dogs, and the poultry netting mostly used in areas adjacent to the sea coast.

★ ★ ★

Hinged Joint Field Fence is made on Holmquist type machines for which special wire feed equipment has been designed which permits feeding coils to the flipping frames from the bottom on hydraulic lifts. With welding of coils this provides a continuous feed with a minimum of handling.

★ ★ ★

As mentioned previously the wire mills do not produce large quantities of nails and barbed wire, the former being made on National, Wafios and Malmedie type machines and the latter on Emery, Bates and a high speed type developed by Lysaght Bros., in which the coil is not rotated in the cradle in the usual manner, but is carried on a central spindle under control of a take up brake.

★ ★ ★

Straightening and cutting, recoiling, wire ties for wool baling, stitching wire and sundry similar products are produced at Newcastle but the practice calls for no comment except that the older straightening machines are marked down for replacement.

★ ★ ★

Industrial Conditions: The wage structure in industry and conditions of employment are established in New South Wales by the Industrial Commission, a statutory body comprising a panel of several judges with a wide general knowledge of industry.

★ ★ ★

A basic wage is established by the Commonwealth Arbitration Court from time to time, being adjusted in accordance with cost of living index figures.

★ ★ ★

The awards of the Commission for the wire mills fix margins over this basic wage for each classification of labour.

★ ★ ★

Independent of the awards, bonus incentives additional to the occupational daily wage, apply in practically all sections of the wire mills. These incentives are related to the machine and plant efficiencies attained over a base. The bonuses are applied on a daily

(*Please turn to page* 1268)

Measurement of Electrical Conductor Characteristics

by L. F. Roehmann
Senior Research Electrical Engineer
Kaiser Aluminum & Chemical Corporation
Department of Metallurgical Research
Spokane, Washington

This paper was prepared for presentation at the Annual Convention of The Wire Association in Pittsburgh, Pa., on October 30, 1956. The author discusses the techniques for measuring accurately "effective" temperature of large conductors as a function of load current and cross-wind speed, and he illustrates them by data obtained on a large size ACSR conductor.

It is axiomatic in engineering research that theoretical and experimental work should complement and corroborate one another. In plain words, calculations should be checked by tests, and vice versa. The field of electrical conductors and in particular bare overhead conductors is no exception. As an example, tables of current rating are published (Ref. 1), based on accepted empirical relations. These formulae, however, contain constants and coefficients which may have been determined on objects and sizes other than those under consideration. Are heat transfer relations obtained on large, smooth boiler tubes applicable to stranded conductors? Are surface emissivity values determined on flat surfaces of varying degree of blackness applicable to weathered conductors? Questions like these warrant careful consideration.

★ ★ ★

Operating engineers, however, are prone to ask more direct, more pertinent questions: What is the current rating for a given conductor size and construction, at varying temperatures, varying wind speeds, various conditions of aging? What are the overload characteristics, that is, how much overload can a conductor carry, and for how long a time? It was to answer questions like these that in 1952 Kaiser Aluminum and Chemical Corporation decided to set up a Conductor Laboratory in its Department of Metallurgical Research. It was the privilege of the author to design and to build this laboratory and to operate it for several years. It is from this experience that some of the following features are discussed and illustrated by measurements on a large size bare aluminum conductor steel reinforced (ACSR).

Equipment

Kaiser Aluminum's Conductor Laboratory has already been described in detail (Ref. 2). Suffice it to say here that a 20 foot length of conductor is installed, horizontally, in the 30 x 7 x 8 foot test chamber. This chamber is thermally well insulated. It can be heated or cooled, or heated and cooled simultaneously. Accurate ambient temperature (ordinarily, 25 ± 0.5C; if necessary, ± 0.2C is obtained by switching on strip heaters in the air ducts, and then adjusting a valve in the freon line of the refrigerator compressor to counteract the heating. This technique is more satisfactory than the customary discontinuous operation of heater element and/or refrigeration machine.

★ ★ ★

Horizontal cross-wind is produced by a custom-built wind machine consisting of twelve fans on one-foot centers. The ten foot test length of the conductor is in front of the wind machine. "Egg-crate" louvers help to make the air stream uniform. Vertical screening strips of different width and mesh size are attached to the louvers, to compensate for wind speed non-uniformities (the wind speed opposite the fan tips is higher than opposite the hubs). Each fan has its trimmer rheostat, and it was found necessary to supply the fans from a magnetically stabilized voltage source. Fan speed is adjusted by a variable auto-transformer and monitored by a stroboscope. Wind speed is measured, every two inches along the conductor, by a Hastings Instrument Company Model H-2 hot-wire air speed meter. Knowing the very considerable difficulties of measuring low wind speeds accurately, we had the air meter calibrated by the National Bureau of Standards. No chain is stronger than its weakest link and it was only when we had the air speed problem under control that we felt reassured of the overall accuracy, and reproducibility, of our tests.

★ ★ ★

To energize the conductor, four power sources are presently available, and a fifth source is under construction. Two small sources furnish d-c and sinusoidal 60 cps a-c, steplessly, from 0-500 amp. Both power sources are magnetically stabilized. Two large sources furnish d-c and 60 cps a-c steplessly from 0-3000 amps. D-c is in both cases obtained from six-phase rectifiers, with a ripple content not exceeding four per cent. The fifth source will furnish three-phase 60 cps sinusoidal current, 0-500 amp, steplessly controlled and magnetically stabilized.

★ ★ ★

D-c resistance is measured with a specially built precision Kelvin bridge, using lead compensation and external standard resistors. These standards are directly in

Fig. 1— Partial View of Conductor Laboratory. * * * * * * * * * *

series with the conductor under test and carry full load current. The largest standard (current-wise) has 10^{-4} ohm resistance, is kerosene-immersed and water-cooled and can carry 3000 amp continuously.

★ ★ ★

A-c resistance is measured with a complex potentiometer. It uses a specially built phase-discriminating electronic null detector. Fig. 1 shows, on the left side, the complex potentiometer, with the null detector on the bracket; on the right side, the Kelvin bridge, with its galvanometer on the bracket, and through the window of the test chamber a cable in front of the wind machine.

★ ★ ★

Ambient temperature is measured with mercury thermometers, having graduations of 1/10C. Conductor temperature is **not** measured with thermocouples. We are equipped to use them and as a matter of fact, we still attach them to the conductor and record temperature. However, we make no use of thermocouple readings in the analysis. This is a radical departure from previous experimental procedures and warrants some discussion.

Measurements

For some time we had suspected that the temperature gradient in large, bare conductors is not negligible: the temperature of the inner layers will be higher than that of the outer layer. This is particularly true when the conductor is subjected to a cross-wise air stream. The temperature on the windward side of the outer layer was observed to be appreciably lower than that on the leeward side. What, then, is the actual temperature distribution within the cross-section, and more important, what is the "effective" conductor temperature?

★ ★ ★

To have a closer look at the problem, we obtained a five foot length of a 1,033,500 circular mil 54/7 "Curlew" ACSR conductor. This conductor contains, around a 7-strand steel core, 54 aluminum wires stranded in three layers (12 + 18 + 24 wires). Wire diameter is 0.1384 inch and overall conductor diameter is 1.246 inch. We took the aluminum strands off, installed four thermocouples over the steel core, replaced the aluminum layers, each time inserting four more couples, and finished with other couples on top of the outer layer. When the conductor was energized at its catalog rated current of 1060 amp, the temperature difference between surface and inner layer was 8 per cent of the average conductor temperature in still, free air; 17 per cent of the average conductor temperature at 2 feet/sec cross-wind and 22 per cent of the average conductor temperature at 3.8 feet/sec cross-wind. Faced with these facts we decided to take a fresh look at the problem. We arrived at the following solution.

Diamagnetic Conductor

When a conductor contains no steel, as in the case of an all-aluminum or all-aluminum alloy conductor the procedure is simple.

★ ★ ★

In a first step, one brings the test chamber, including the non-energized conductor, to 20C and waits until temperature equilibrium is established. This condition is reached when there is no resistance change observed with the Kelvin bridge (using small current intermittently at approximately five per cent of rated). D-c resistance is then measured, and incidentally checked against the catalog value.

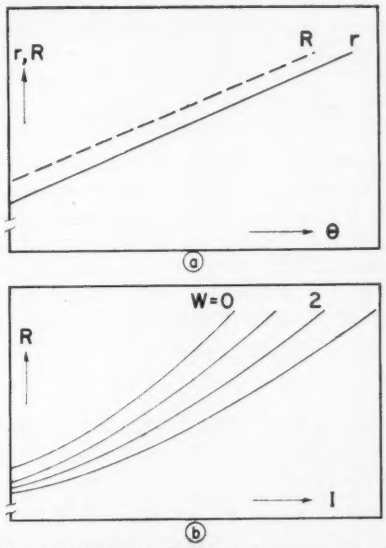


Fig. 2—Diamagnetic Conductor. * * * * *

If the temperature coefficient α of the conductor material is known (for instance, $\alpha = 0.00403$ for EC aluminum) the d-c resistance versus temperature relation (r vs Θ) is calculated and drawn, Fig. 2a, solid line. If α is not known, the r vs Θ relation is determined experimentally after bringing the chamber including the non-energized conductor to different temperatures (always waiting for equilibrium to be established).

In a second step, the a-c resistance versus temperature relation (R vs Θ) is calculated, using the well known skin-effect tables (Ref. 3) or curves (Ref. 4). Refer to Fig. 2a, dotted line.

★ ★ ★

In a third step, the conductor is energized with alternating current. A-c resistance is measured versus alternating current (R vs I), at a given ambient temperature, usually 25C, and for different wind speeds W, usually 0 and 2 feet/sec, with intermediate and higher values. Equilibrium condition, for each value of current I, is ascertained by constancy of the complex potentiometer reading. R versus I is then plotted with wind speed W as parameter, Fig. 2b.

★ ★ ★

For the analysis, one determines from Fig. 2b R for given values of I (and of W); obtains, from Fig. 2a, the "effective" temperature Θ for the value of R and from Θ the d-c resistance r so that R/r is the a-c/d-c resistance ratio at temperature Θ.

Ferromagnetic Conductor

In a ferromagnetic conductor, as for instance ACSR, the procedure is a bit more involved because the a-c resistance, R, is no longer a unique function of temperature Θ but a function of both, Θ and current I. The following procedure gives the desired result.

★ ★ ★

In a first step, determine d-c resistance r versus temperature Θ, Fig. 3a, as above.

★ ★ ★

In a second step, determine a-c resistance R versus alternating current I, with wind speed W as parameter, Fig. 3b. (This step is similar to step three for the diamagnetic conductor).

★ ★ ★

In a third step, determine d-c resistance r versus direct current i, with wind speed W as a parameter, Fig. 3c.

★ ★ ★

The analysis presupposes that

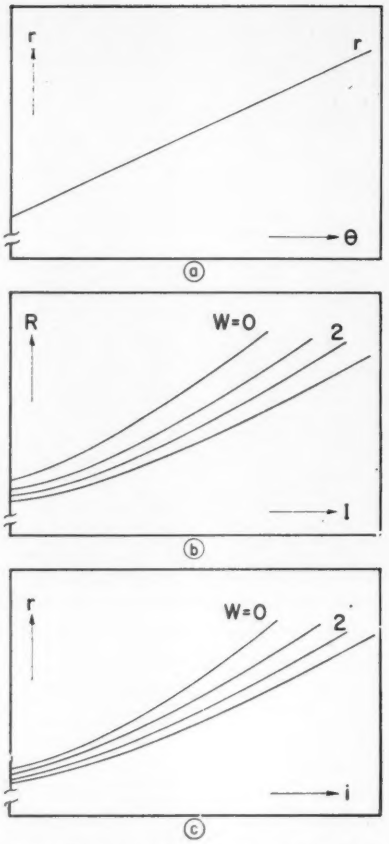


Fig. 3—Ferromagnetic Conductor. * * * *

the same power P, whether it is obtained as I^2R or i^2r, will produce the same "effective" conductor temperature provided that ambient temperature (25C) and cross-wind speed W are the same in both cases. Consequently, one determines from Fig. 3b, I^2R from corresponding values of I and R (for a given wind speed W). In Fig. 3c one determines, by trial and error, such corresponding values of i and r (for the same W) that $i^2r = I^2R$. In Fig. 3a the "effective" conductor temperature Θ is found for r and, by inference, also for R so that R/r is again the a-c/d-c resistance ratio at temperature Θ, as in the case of the diamagnetic conductor.

Example

Application of the method to a ferromagnetic conductor is illustrated in Figures 4 to 6. Test object was a 1,033,500 circular mil 54/7 "Curlew" ACSR conductor, with a nominal d-c resistance of 0.01687 ohm per 1000 feet at 20C, and a nominal rated current of

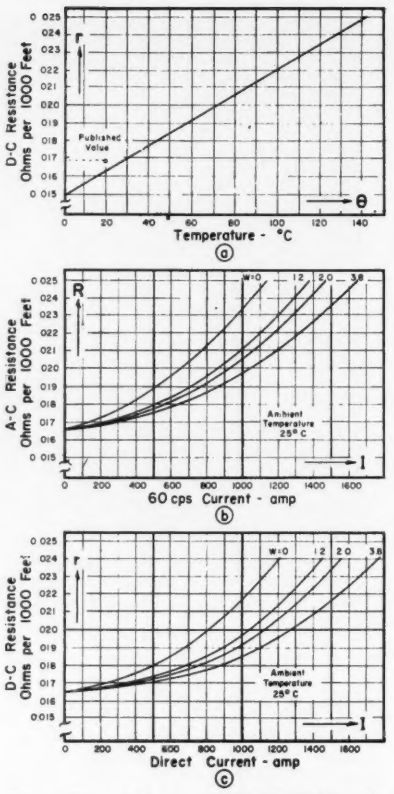


Fig. 4—Test Data on "Curlew"—Bright Conductor. ("i" should be "I" in 4C) * * * *

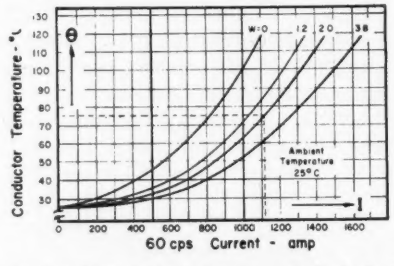


Fig. 5—"Curlew" Analysis: Θ vs. I. * * * *

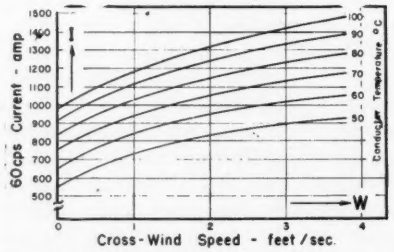


Fig. 6—"Curlew" Analysis: I vs. W. * * *

1060 amps for 25C ambient temperature, 75C conductor temperature, 2 feet/sec cross-wind and average tarnished surface (Ref. 1). Fig. 4a shows the r vs Θ relation (obtained in this case from measurements at three ambient temperatures). Fig. 4b shows R versus I, with wind speeds W = O,

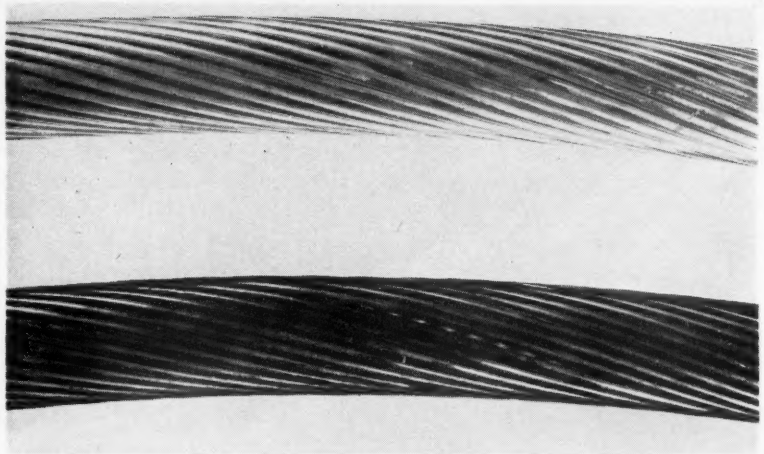


Fig. 7—"Curlew" Conductor. Top: bright. Bottom: blackened.

1.2, 2.0, 3.8 feet/sec, as a parameter. Ambient temperature was 25C. Fig. 4c shows the corresponding d-c curves.

★ ★ ★

Fig. 5, the result of the analysis, shows Θ versus I, with W as parameter. Fig. 6 is a re-plot of Fig. 5 namely I versus W, with Θ as parameter. All these data were obtained on a bright conductor. The rated current was measured as 1110 amp, about five per cent higher than the published rated current of 1060 amp.

★ ★ ★

To simulate aging in an industrial environment the conductor was then chemically blackened by several applications of Aluminum Black, a solution manufactured by the Birchwood Chemical Company of Minneapolis, Minnesota. Fig. 7 shows lengths of bright and blackened conductor side by side. Fig. 8 is a plot of Θ versus I for the bright and black conductors, at 2 feet/sec cross-wind and 25C ambient temperature. As known, current carrying capacity increases with "age": the blackened conductor carried 1190 amp, compared to 1110 amp for the bright conductor for the same temperature rise.

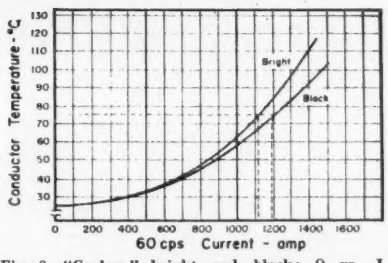


Fig. 8—"Curlew," bright and black: Θ vs. I, at W = 2 feet/sec. (ordinate and abscissa respectively)

★ ★ ★

Finally, overload tests are shown in Fig. 9. They were made on the bright conductor. The published rated current of 1060 amp was first applied and held until equilibrium conditions were established. Current was then increased to 125, 150 and 175 per cent of published rate, and the conductor temperature versus time curves (Θ vs t) were established. Cross-wind speed W was again the parameter, and ambient temperature was held at

(*Please turn to page* 1266)

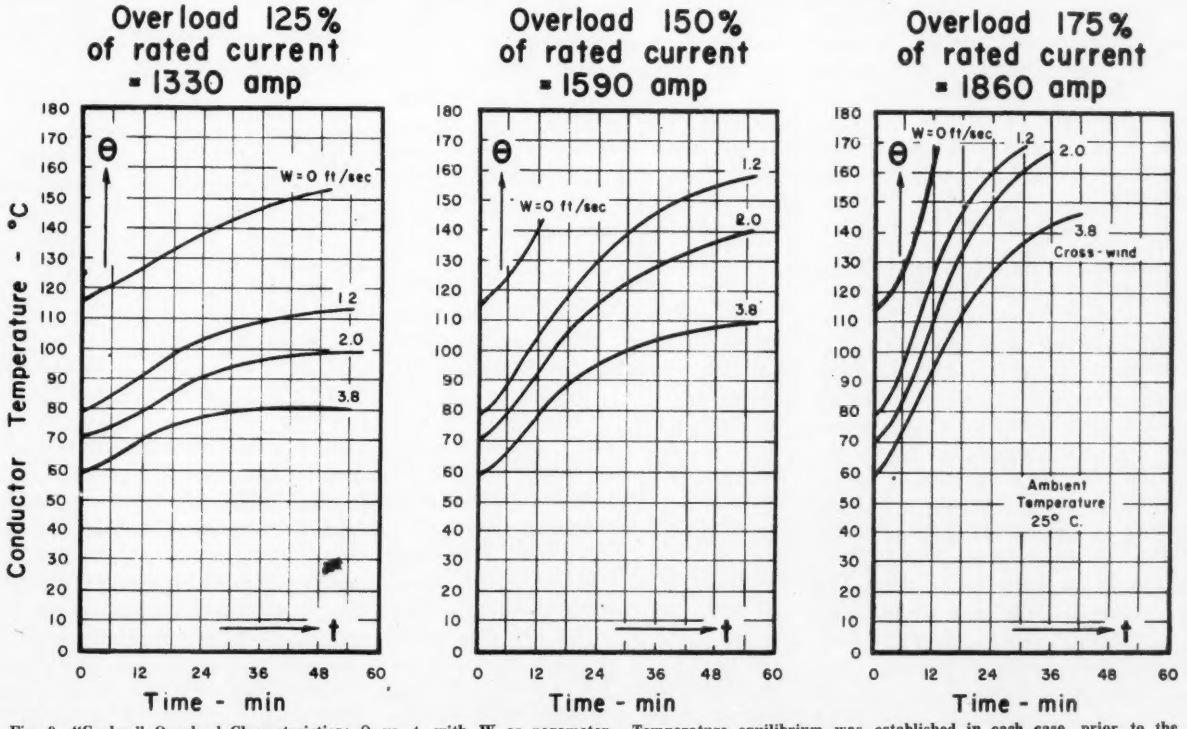


Fig. 9—"Curlew" Overload Characteristics: Θ vs. t, with W as parameter. Temperature equilibrium was established in each case, prior to the application of the indicated overload current, by using the published rated current of 1060 amperes.

Automotive Zigzag Spring Wire

by Webster J. Van Horn, Metallurgist
Rod and Wire Division, Portsmouth Works
Detroit Steel Corporation
Portsmouth, Ohio

This paper was prepared for delivery at the Annual Convention of The Wire Association in Pittsburgh on October 30, 1956.

In it the author describes the current practices of manufacture of this specialty wire, with procedures for controlling quality.

During the past few years the automotive industry has been using a new type of hard drawn spring wire in the construction of automobile seat and back spring units. This new type of wire known as Automotive Zigzag Spring Wire or Special Zigzag Spring Wire, is formed or corrugated into zigzag ribbons on high speed intricate machines. After stress relieving, the ribbons are folded or bent on automatic machines into finished springs of various shapes.

★ ★ ★

It can readily be seen that this wire must have the maximum degree of toughness, ductility, uniformity, and strength obtainable in order to withstand the extremely severe deformation. This paper presents a manufacturing practice which is currently being employed to produce Automotive Zigzag Spring Wire or Special Zigzag Spring Wire. Some attention is given to the discussion of desirable physical properties of the wire, also to the methods of inspection, testing, bundling, and shipping.

★ ★ ★

Automotive Zigzag Spring Wire is a round, high carbon, hard drawn steel wire normally produced in sizes 13 gage (0.0915″) to 8 gage (0.162″) inclusive. The wire is drawn from steel produced by the open hearth furnace process. The steel must be made according to good furnace, ladle, pouring, and mold practice. Proper heating in the soaking pits before rolling is necessary. The rolling technique is important, since the end product requires a steel which is of sound quality and meets all metallurgical requirements.

★ ★ ★

After extensive research, it was found that a fine grain steel of the following chemical analysis range gives the best results:

Carbon	**0.55%—0.65%**
Manganese	**0.90%—1.10%**
Phosphorus	**0.040% Max.**
Sulphur	**0.050% Max.**
Silicon	**0.10%—0.30%**

★ ★ ★

A fine-grain steel is used because of its inherent toughness. Fabricators stress relieve or heat treat the zigzag ribbons before folding or bending into finished springs. To withstand the severe bending the steel must have toughness and must have ductility. Finished springs formed without stress relieving show better fatigue life than those which have been stress relieved. The finished springs which have not been stress relieved, however, take a larger permanent set which makes them undesirable for seat units.

★ ★ ★

The steel is rolled to rod size from selected billets. Necessary rod size is determined by the required physical properties of the finished wire; for example, #5 rod is rolled for .0915″ finished wire and ¼″ rod for .1483″ size. The hot-rolled product is constantly checked for soundness and rolling defects. Hot-rolled rods are trimmed, both front and back ends, on the rod conveyor and sample pieces from all ends are fractured and examined visually. In addition to inspecting for visible surface and internal defects; size, cross section, condition of coils, proper identification are all checked during the trimming operation. A representative number of test pieces from each heat of steel rolled is saved for chemical analysis determinations and for upset testing.

★ ★ ★

The hot-rolled rods are heat-treated by patenting after they have been proven satisfactory, quality-wise, for Automotive Zigzag Spring Wire. Physical properties and micro-structures of the hot-rolled rod vary widely within each coil. The micro-structure of the outside strands of a coil which have cooled rapidly from above the critical temperature is very different from that found in the inner strands which have cooled much more slowly. Patenting produces a uniform structure throughout the coil and at the same time, if properly controlled, produces a structure which is conducive to cold drawing.

★ ★ ★

The importance of patenting in the manufacture of Automotive Zigzag Spring Wire cannot be overemphasized. It is here that the physical structure is produced which will result in finished wire with desirable physical properties. We have found that Air-Lead Patenting gives the required uniformity of product. This process consists of heating the rods in a gas-fired muffle type furnace and quenching through a pan of molten lead. Precise control is maintained over heating and cooling throughout this process; therefore, the necessary high degree of uniformity is obtained. Maintaining this quality control requires constant and expert attention. Automatic temperature control instruments, both on the patenting furnaces and molten lead pans, are checked

daily to make certain they are functioning accurately. Speed of the take-up units is frequently determined. Representative samples of the patented product are delivered to the physical laboratory for physical testing during each eight hour period and at the beginning of a new heat of steel.

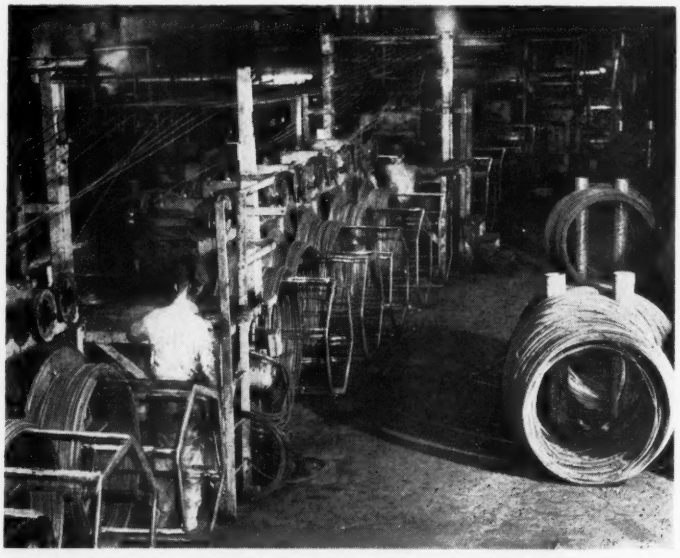


Fig. 6—Rod patenting unit used to patent rods for automotive zigzag spring wire.

In developing the manufacturing practice for Automotive Zigzag Spring Wire, numerous experimental lots were made. The charts below show the results from such an experimental lot in which seven different grades of steel were used. Hot-rolled rods from seven heats of steel were selected, one half of each heat was air-air patented and one half air-lead patented. After cleaning and coating, each heat was drawn to 12 gage wire. The results given below in Charts #1 and #2 reflect the effect of chemical analysis and method of patenting on the physical properties of the rods and finished wire.

★ ★ ★

Figure #1 shows the average tensile strength (in pounds per square inch) developed in air-air patented and air-lead patented 5 rods. It should be pointed out that all rods were carefully patented on the same unit at the same time with special emphasis on maintaining uniform conditions of temperature and speed throughout the experimental run. Figure #2 shows the average tensile strength (in pounds per square inch) developed in the 12 ga. wire drawn from the air and lead patented rods. All wire was drawn on the same wire-drawing machine under identical conditions. Figure #3 shows the average increase in tensile strength (in pounds per square inch) developed in 12 ga. wire drawn from air and lead patented rods.

★ ★ ★

The patented rods are then cleaned in sulphuric acid to remove the scale, water rinsed, and coated with borax for cold drawing. The purpose of coating is twofold; first, since borax is basic in nature it neutralizes any trace of acid left from acid cleaning and; secondly, it acts as a carrier for the lubricant in the subsequent wire-drawing operation. Borax was found to be a better coating material than lime, since it does not sludge out as readily as lime in the coolant used by fabricators on their corrugating machines. A second advantage of borax-coated wire is its better or faster reaction to induction type heat treatment sometimes employed during the folding of zigzag springs.

★ ★ ★

Patented, cleaned, and coated rods are delivered to the Wire Mill to be cold drawn into finished wire. Wire drawing is done on continuous slip-type machines equipped with water-cooled dies and water-cooled blocks or capstans. Sufficient cooling is very important in this high speed operation, since excessive heating of the wire will cause precipitation hardening or accelerated aging. Precipitation hardening, in turn, will increase the tensile strength and yield strength or resistance to permanent set.

CHART NO. 1

Chemical Analysis					Average Tensile Strength	
C	Mn	P	S	Si	Air Patent #5 Rod	Air Patent 12 ga. Wire
.52	1.00	.013	.024	.17	119,330 psi	200,040 psi
.55	.99	.016	.024	.17	126,530 psi	210,660 psi
.58	.94	.014	.027	.20*	131,450 psi	218,130 psi
.62	.82	.014	.026	.19	135,500 psi	222,210 psi
.63	.65	.020	.025	.16	130,580 psi	218,910 psi
.64	.95	.016	.028	.22*	140,530 psi	229,490 psi
.66	.65	.017	.021	.19	133,050 psi	226,020 psi

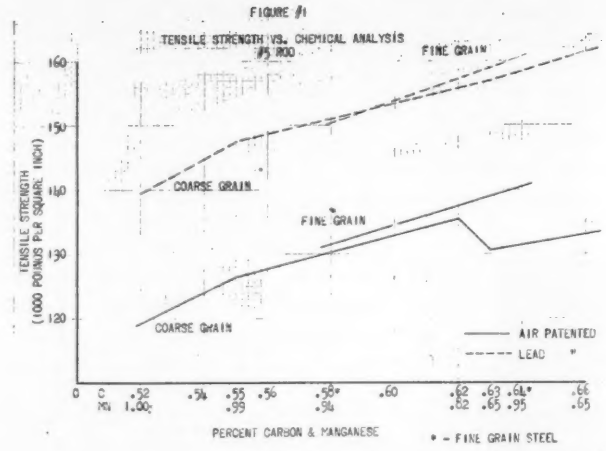
* Fine grain steel

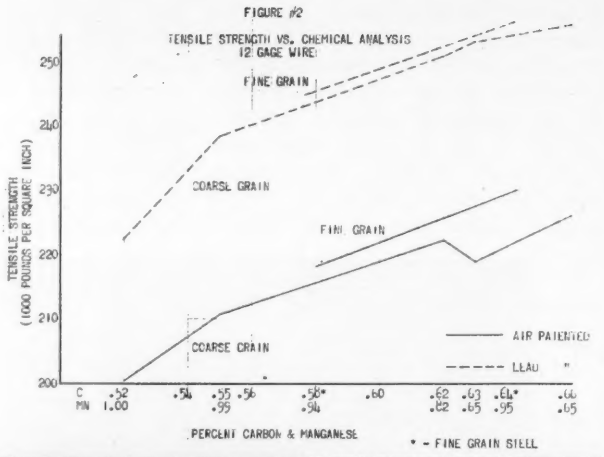
CHART NO. 2

Chemical Analysis					Average Tensile Strength	
C	Mn	P	S	Si	Lead Patent #5 Rod	Lead Patent 12 ga. Wire
.52	1.00	.013	.024	.17	139,400 psi	222,430 psi
.55	.99	.016	.024	.17	147,600 psi	238,200 psi
.58	.94	.014	.027	.20*	150,580 psi	245,360 psi
.62	.82	.014	.026	.19	155,950 psi	250,810 psi
.63	.65	.020	.025	.16	156,950 psi	252,940 psi
.64	.95	.016	.028	.22*	160,860 psi	255,530 psi
.66	.65	.017	.021	.19	161,400 psi	255,530 psi

* Fine grain steel

Rods are placed in back of the wire-drawing machines on flipping booms and ends of rod coils are welded together using an electric butt welder. Wire-drawing machines are equipped with automatic counters which stop the machines when the correct bundle weight is reached. Wire is now being drawn in 600# or 1200# bundles depending on the finished wire size. As mentioned previously, the starting





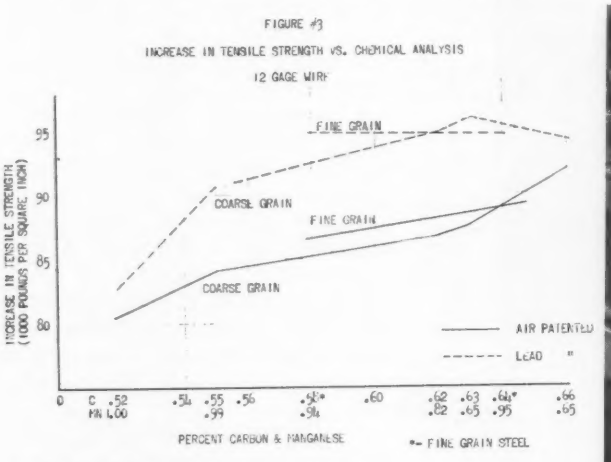


Fig. 7—Continuous wire drawing machine drawing automotive zigzag spring wire.

rod size is dependent on the finished wire sizes; for example, 13 gage (.0915") is drawn five drafts from #5 rod and 12 gage (.1055") is drawn four drafts from the same rod size.

★ ★ ★

The wire-drawing machine operator is responsible for maintaining the quality standards established for Automotive Zigzag Spring Wire. He must constantly check lubrication, gage, cast, lay, finish, proper cooling, and correct identification of samples and finished wire. A sample is cut from each bundle of finished wire by the machine operator, and it is identified with a double serial number tag. All samples accompany the wire into the inspection and bundling area. Gaugers are employed in the Wire Mill to double-check the work of the machine operator. In addition to inspecting wire being drawn for finish, gage, cast, lay, and identification, the gauger periodically delivers test pieces to the laboratory for physical testing.

★ ★ ★

Bundles of finished wire are delivered on trucks to the inspection and bundling area. The wire inspectors visually inspect each truckload of wire checking the gage, finish, identification, and condition of bundles. Sample ends with serial number tags are removed from each load at this time, and the various physical properties are determined. Lay and cast are checked on each sample. Ductility is determined by means of a jig test. Tensile strength is obtained in the usual manner. Another test known as "Pigtail Test" is made on samples from every bundle of finished wire.

★ ★ ★

The following table shows tensile strength ranges for various sizes. If other physical properties are satisfactory, finished wire which falls into these tensile strength ranges will fabricate satisfactorily.

Gage	Tensile Strength Range
8	195/225,000 psi
9	200/230,000 psi
9½	200/230,000 psi
10	205/235,000 psi
10½	205/235,000 psi
11	210/240,000 psi
11½	210/240,000 psi
12	215/245,000 psi
12½	215/245,000 psi
13	220/250,000 psi

★ ★ ★

A large fabricator of Automotive Zigzag Spring Wire has developed a quick, accurate, and easily duplicated test which actually measures the amount of set or

(*Please turn to page* 1258)

Certain Aspects of the Operation and Maintenance of the Properzi Continuous Casting and Rolling Mill

V. G. G. Nayar, General Manager
K. R. K. Nair, Works Superintendent
The Aluminum Industries Limited
Kundara, South India

Introductory Remarks by Frank R. Nichols

It gives me great pleasure to introduce to this body Mr. **V. G. G. Nayar,** who is General Manager of **The Aluminium Industries Limited,** Kundara, South India, and who will present a paper entitled, "Certain Aspects of the Operation and Maintenance of Properzi Continuous Casting and Rolling Mill," which has been prepared by him and Mr. **K. R. K. Nair,** Works Superintendent of the same company.

★ ★ ★

I believe that a brief history of the Aluminium Industries Limited can best serve to introduce Mr. Nayar.

★ ★ ★

It is a relatively new company, having been in operation for only a few years. Its plant is located at Kundara, in Travancore-Cochin State, South India. This is on the West Coast of India, very near to the tip of the peninsula. While there are some basic electro-chemical and metallurgical industries of considerable size operating nearby, the economy of this region is primarily agricultural, and there existed no pool of skilled labor which could be drawn upon to staff a plant. Mr. Nayar, a Graduate Engineer, was sent for training to Canada, where he spent considerable time in various Alcan plants.

★ ★ ★

Upon his return to India, it was his responsibility to set up the plant, train the necessary labor, employ and train the members of the management staff, and produce ACSR and accessories to meet specifications. In addition to this heavy load, he also has been a regular contributor of technical articles to various engineering Journals.

★ ★ ★

I believe you will agree with me that Mr. Nayar had quite a job cut out for him, particularly when you bear in mind that the great bulk of the people employed by the Company had had no industrial experience whatsoever. I should add that the Labor Relations at their plant have been consistently good.

★ ★ ★

Today, The Aluminium Industries Limited is the leading producer of aluminum wire and cable in India and it is a growing and expanding company. This represents an industrial achievement of a very high order, and the credit for much of it is attributable to the abilities and personality of Mr. Nayar.

★ ★ ★

I visited his plant in Kundara in 1953 prior to the installation of the Properzi equipment, which Mr. Nayar will discuss in his paper today. The esprit de corps was very high, and it was evident that all members of the staff who had participated in the success of the Company felt fully qualified to take on more and tougher problems.

★ ★ ★

While there, I first met Mr. K. R. K. Nair. He was sent to Davenport early in 1954 for training on our Properzi Machine, and he spent approximately two months with us, during which time I got to know him well. He is a Graduate Electrical Engineer of great ability. He has a most retentive mind and is very ingenious.

★ ★ ★

I should like to comment on the difficulties of operating in an area so far removed from industrial centers as Kundara. If and when a breakdown occurs, it is not possible to call up some conveniently located engineering company or supplier to come over and service equipment. It might be a matter of weeks before such services, that we consider customary, could be rendered.

★ ★ ★

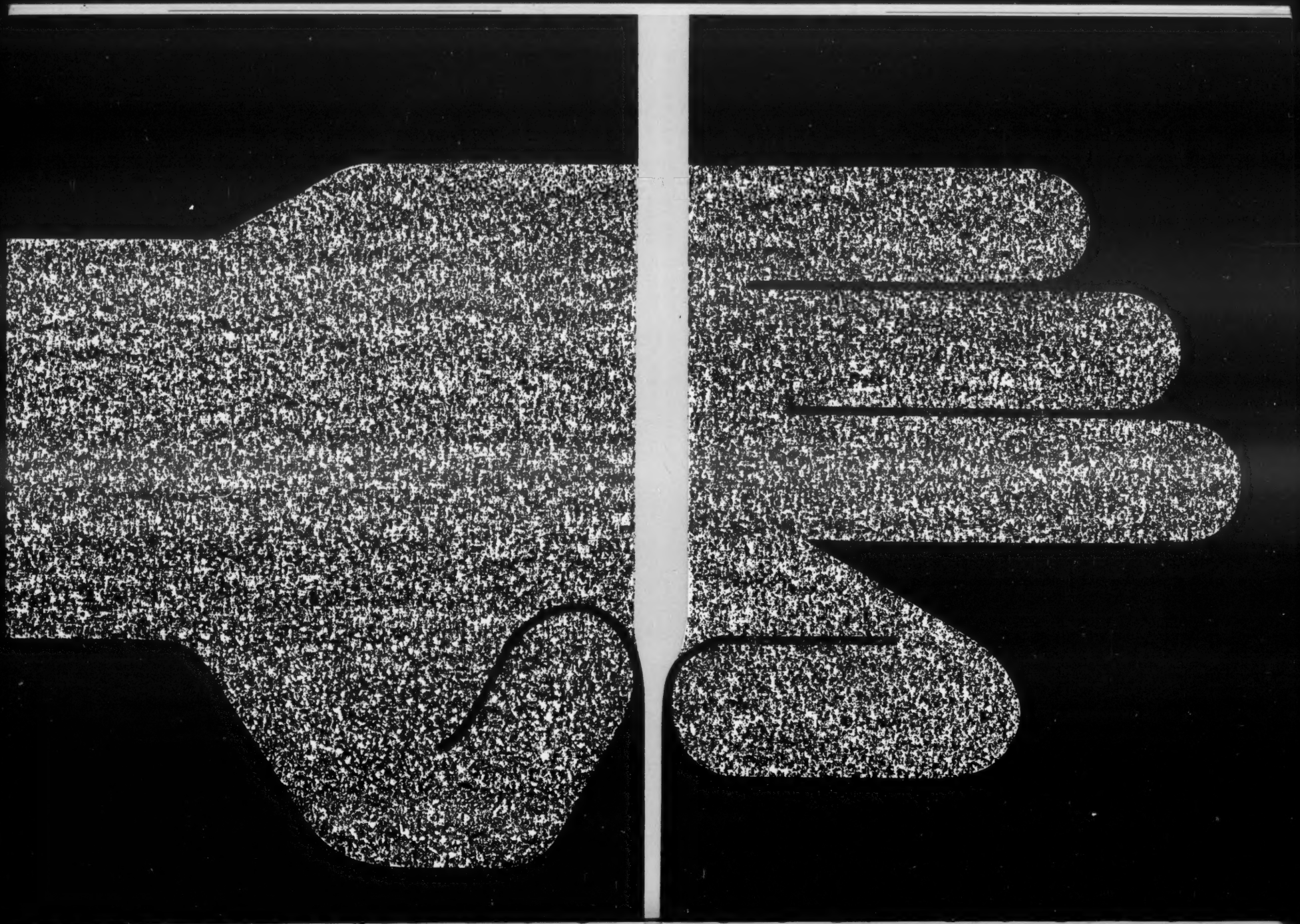
The result of these circumstances is that, in order to keep things going, there must be a high degree of ingenuity, proficiency, and imagination on the part of those charged with the responsibility of continuing operations, and Mr. Ramakrishnan Nair certainly possesses all of these qualifications. In effect, he has got to be good—and he is good!

★ ★ ★

India is a great country with many assets, but she also has many problems. One of her greatest assets is men of the character of Mr. Nayar and Mr. Nair. The purposefulness and application of these men, and many others like them, is helping India to alleviate and solve her problems.

★ ★ ★

I have the honor to present my friend, Mr. V. G. G. Nayar.



IT'S A WORLD OF WIRE

And every day, SYNCRO machines help manufacture globe-encircling miles of it in wire and cable mills all over the world.

But all of our business is really local, because no matter where our customers are, each has his particular requirements and problems. Finding the answers for each individual customer is a SYNCRO specialty.

There's always a new challenge, and its solution for us to achieve. We figure, "Better machines make better customers. Keep on top of those challenges, and you keep your performance on top of the world!"

Why choose SYNCRO machines? Because their design and performance are definitely among the world's best.

Look to SYNCRO's experience for smoothly performing, high profit-making wire drawing machinery.

SYNCRO®

SYNCRO MACHINE COMPANY

Perth Amboy, New Jersey, U.S.A.

affiliated company: WINGET SYNCRO Ltd. Rochester Kent, England

WIRE DRAWING MACHINES • DIE STRINGERS • CONTINUOUS ELECTRIC ANNEALERS • PAYOFFS • CAPSTANS • WIRE INSULATORS • HEAVY DUTY TAKEUPS • TAPERS • SPECIAL MACHINERY

Historical

Mr. Ilario Properzi—after whom the process is named—developed the continuous casting and rolling process several years ago, to provide lead wire for the manufacture of shot.

★ ★ ★

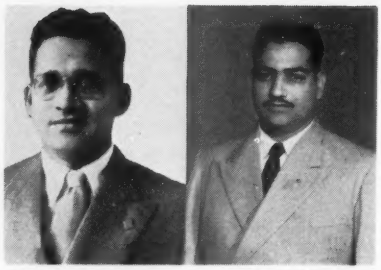
The original scheme used a wheel with a water cooled rim in which is cut a triangular groove. An endless belt of low carbon steel closes the mould cavity into which the molten metal is poured. As the wheel revolves, the bar is carried through a water trough, then separated from the belt and on to a tandem mill designed for the unusual triangular cross-section and is taken off as a finished wire rod.

★ ★ ★

Lead with its softness and low melting point (680 deg. F), proved the easiest of all nonferrous metals to be cast and rolled. Higher melting point, hardness and other physical properties posed several problems while adapting the process for other metals and alloys.

★ ★ ★

The process was perfected for zinc (melting point 787 deg. F) next. Later with the help of the Montecatini group, the process was tried for production of aluminum redraw rod. Thanks to the interest taken in the process by **Mr. Frank Nichols** and the zeal with which he has been able to sell the 'Properzi' idea to the aluminum cable industry, more than a dozen units located all over the world are today successfuly casting and rolling electrical conductor grade aluminum redraw rod. It is learnt that Mr. Properzi is now engaged in experiments for adapting the process for the continuous casting and rolling of electrolytic copper.



V. G. G. Nayar K. R. K. Nair

A paper prepared for presentation at the Annual Convention of The Wire Association on October 30, 1956, in Pittsburgh, Pa. Mr. Nayar graduated in 1943 from Madras University with a degree of Electrical Engineer. He has worked with various Indian and Canadian wire and cable companies. He joined The Aluminum Industries Ltd. in 1948 as Works Manager and subsequently was made General Manager.

Mr. Nair, also an Electrical Engineer, joined the company in 1950 as Plant Foreman and was made Works Superintendent in 1952. In 1954 he went to Europe and the U. S. A. to study the Properzi process, as a result of which the equipment was installed and is operated at Kundara under his supervision. Much of the output is used for ACSR aluminum cable.

The remarks made by Frank R. Nichols, President of Nichols Wire and Aluminum Co., in introducing the speaker, are included here as a prelude to this paper.

★ ★ ★

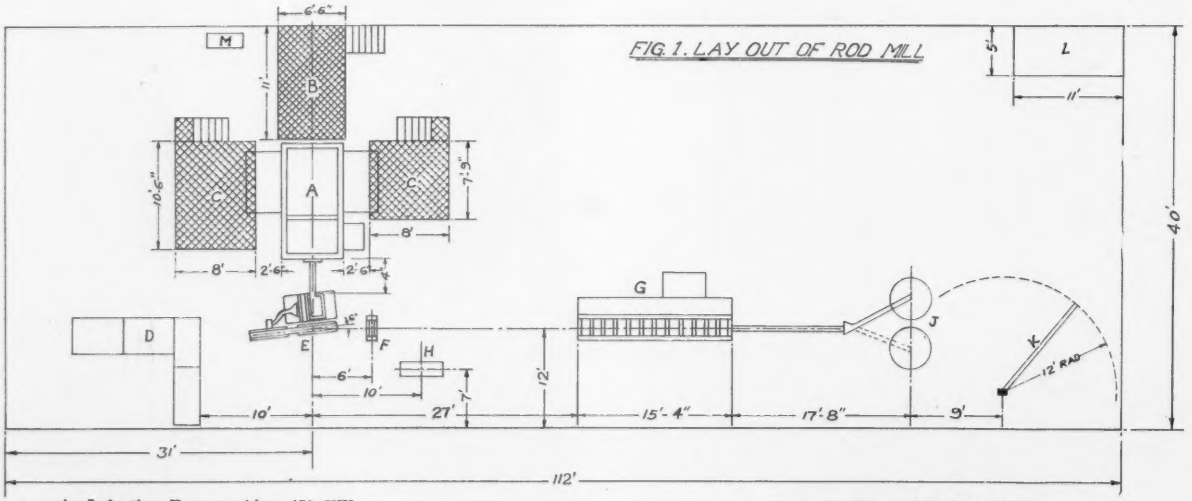
Along with the development of the process from lead to zinc and to aluminum, several major changes in design were made, resulting in increased production rate. Mills equipped with Models No. 5 and No. 5A machines cast and roll approximately one ton of aluminum per hour, while the earlier models have a rated output of only 1,000 to 1,200 pounds per hour. The latest model and the last of the series for aluminum, i.e., Model No. 6 machine has a rated output of more than 3,300 pounds of aluminum rod per hour. This increase in output has been made possible by increasing the area of the cast section (see chart I):

Chart I

Model No.	3	3A	4	5&5A	6
Area of section (sq. in approx.)	.275	.5	.75	1.15	1.5

Equipment

The main pieces of equipment



A Induction Furnace Ajax 450 KW
B Furnace Charging Platform
C Furnace Cleaning Platform
D Furnace Control Panels
E Casting Machine
F Cast Bar Guide
G Properzi Rolling Mill
H Operating Desk
J Coiling Baskets—48 Ins. Dia.
K Coil Lifting Hoist—Rotating
L Mill Motor Control Panel
M Furnace Tilting Hydraulic Pump

(fig. 1) in the rod mill at Kundara are:

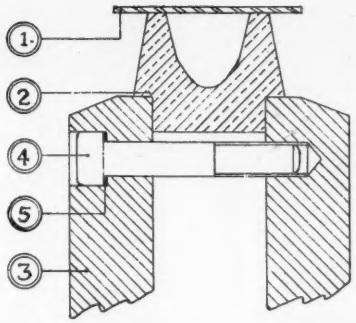
(a) a melting furnace
(b) a continuous casting machine
(c) a multi stand rolling mill

★ ★ ★

Melting furnace: The melting furnace at Kundara is an Ajax 450 kw double chamber combined melting and holding low frequency induction furnace with fully automatic temperature control gear. The furnace has a melting capacity of approximately one ton of aluminum per hour. Continuous pouring is effected by back-tilting the furnace by a high pressure hydraulic system which also controls the draw. Charging is continuous and is proportionate to the draw, the level of metal inside the furnace being kept steady. A charging platform at the back and inspection and inductor cleaning platforms on either side complete the equipment.

★ ★ ★

Continuous casting machine: The casting equipment consists of a small holding pot which receives molten metal from the furnace and a slowly rotating casting wheel, driven by a 2.5 h.p. DC motor. A grooved copper ring held between two steel plates (fig. 2) forms the casting wheel. An endless steel belt kept tight by an idler wheel covers the bottom half of the copper ring and makes a closed mould. A narrow tube (approximately half an inch internal dia.) fixed to the bottom of the holding pot and positioned at the starting end of the cavity formed by the groove in the wheel and the steel belt, feeds the mould with molten metal (fig. 3). Cooling of the mould is effected by water circulating inside the casting wheel and by jets of water directed on to the outer periphery of the copper ring.



1 STEEL BELT
2 GROOVED COPPER RING
3 STEEL PLATES
4 CLAMPING STUD
5 COPPER WASHER

FIG. 2.
SECTION OF CASTING WHEEL

★ ★ ★

Rolling Mill: The rolling mill has thirteen stands and at the thirteenth stand, 9/32 inch dia. rod is rolled out. The stands are driven by gearing from a common shaft. The whole mill is driven by a 75 h.p. DC motor permitting variations in speed. Each of the stands has three rolls, positioned at 120 degrees apart. The rolling sequence is from triangle to round and then to triangle, till at the eleventh stand, three-eighth inch dia. round section is obtained. The rod—though slightly hexagonal — is quite suitable for redrawing to the popular sizes of wire for ACSR.

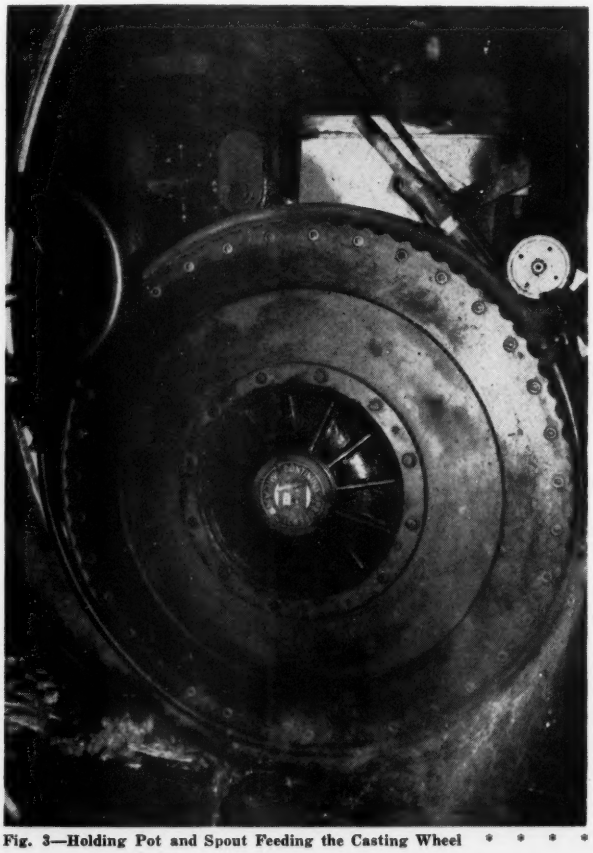


Fig. 3—Holding Pot and Spout Feeding the Casting Wheel * * * *

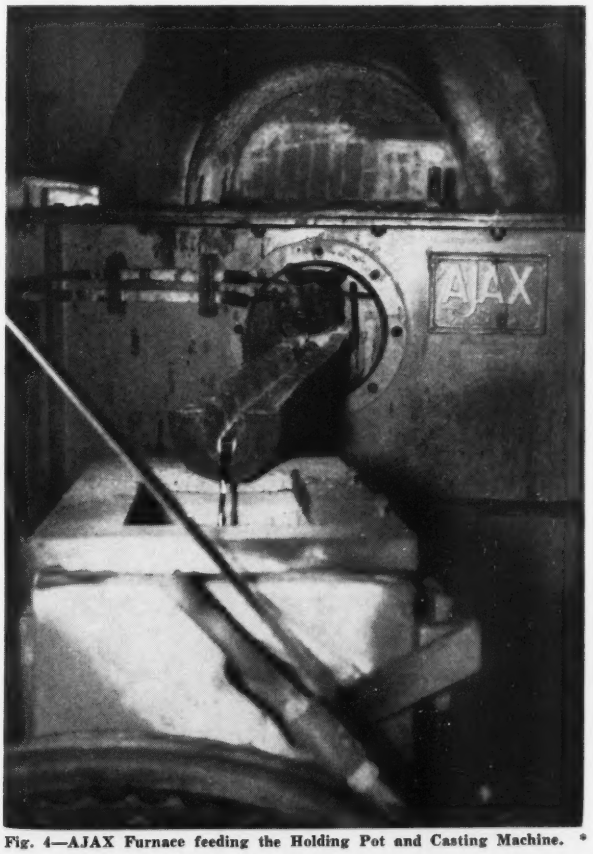


Fig. 4—AJAX Furnace feeding the Holding Pot and Casting Machine. *

Fig. 5—Triangular Bar leaving the Casting Machine.

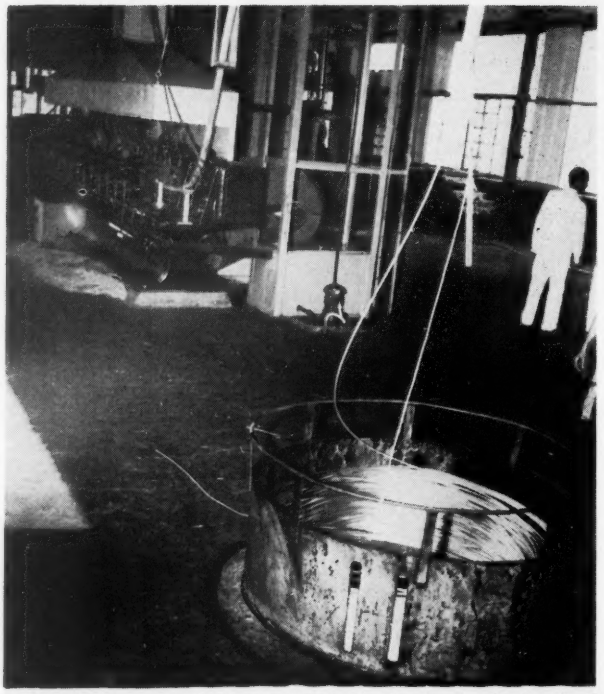


Fig. 6—Coiling.

A suitably bent guide pipe makes the rod fall in coils into sheet metal baskets. With a thirty-six inch dia. basket, coils of up to three hundred pounds weight can be obtained while with forty-eight inch dia. baskets, five hundred to six hundred pounds continuous coils are possible.

Operation

Lay out: For satisfactory results, the metal feed must be at constant temperature and free from oxide. To enable this, the run from the furnace to the holding pot must be short and the drop limited to the minimum possible. The casting machine is placed close to the furnace (four feet away in our case) and the level of the holding pot is within two to three inches of the furnace spout (fig. 4).

★ ★ ★

For smooth and free movement of the cast bar and to ensure minimum strain on the casting machine in the event of a heavy pull in the cast bar, the centre line of the casting machine is offset by about six deg. to the centre line of the roll stands (fig. 1).

★ ★ ★

To take care of fluctuations in casting and rolling speeds, it is necessary to provide sufficient extra length in the cast bar in the form of a loop between the casting and rolling machines. A distance of twenty-five feet between the casting wheel and the entry to the rolling mill will suffice.

★ ★ ★

When the mill runs faster than the casting rate, the loop in the cast bar will straighten and ultimately exert a severe pressure on the casting machine. To prevent this, the cast bar is taken over a spring loaded guide roller provided with an electrical stop switch connected to the mill motor control (fig. 5). When the pressure on the roller exceeds the spring pressure, the stop-switch is actuated and cuts off power supply to the mill motor. When sufficient loop in the bar is formed again, the mill can be restarted.

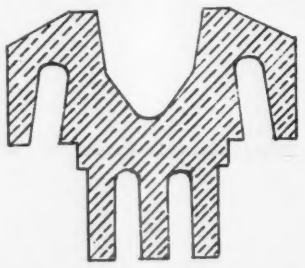


Fig. 7 - Section of Casting Ring Model 6 Machine

★ ★ ★

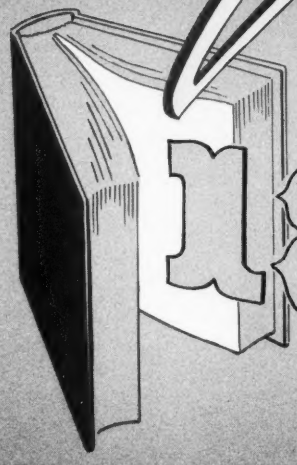
Process: Molten aluminum from the furnace is poured continuously into the holding pot of the casting machine. This in turn feeds the rotating casting wheel through the spout. Molten metal is immediately solidified and travels with the wheel through approximately hundred and eighty degrees. A stripper placed over the casting wheel opposite to the pouring spout pushes out the cast bar which is then taken over the guide roller and into the rod mill. In the mill, the bar is rolled down to three-eighth inch diameter. The rolls are cooled and lubricated by an emulsion of soluble oil (30:70), which is circulated from a tank positioned near the mill. The consistency of the emulsion is maintained for uniform results in the rolled rod. On leaving the mill, the rod is guided through the guide pipe and falls in coils into the sheet metal receptacles (fig. 6).

★ ★ ★

The operation of the Properzi

(*Please turn to page* 1262)

Vaughn®



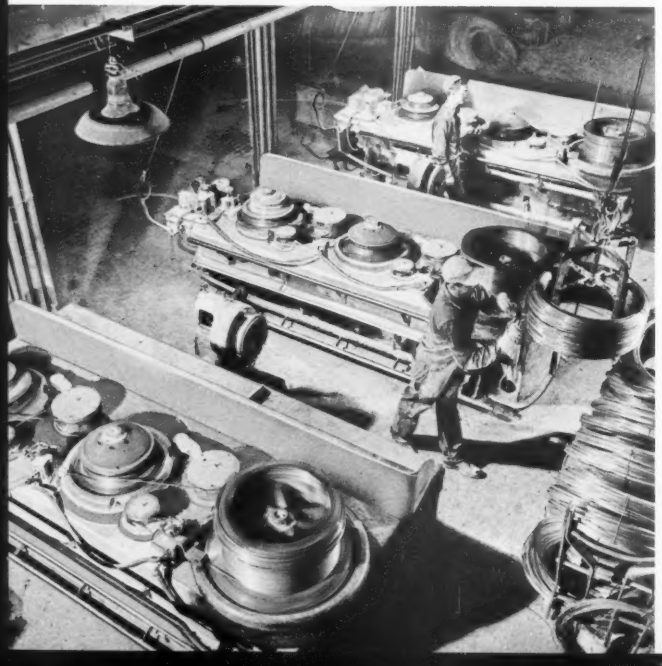
1856 1956

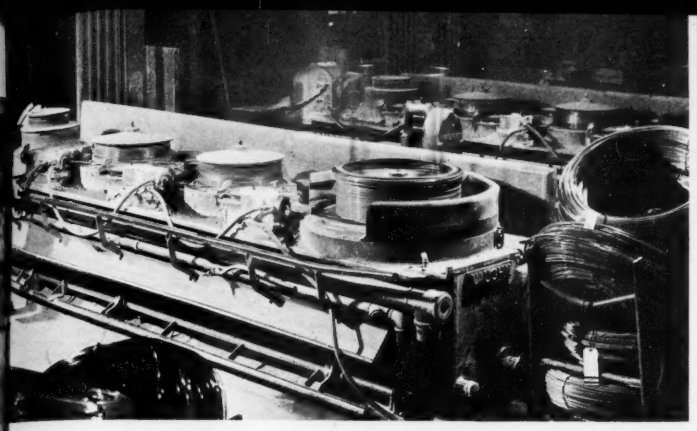
ONE HUNDRED YEARS
A MANUFACTURING ORGANIZATION
—TODAY SERVING PROGRESSIVE
WIRE MILLS EVERYWHERE
WITH *"Quick on the Draw"*
EQUIPMENT FOR THE BETTER,
MORE PROFITABLE PRODUCTION OF
WIRE FOR THE NEEDS OF AMERICA

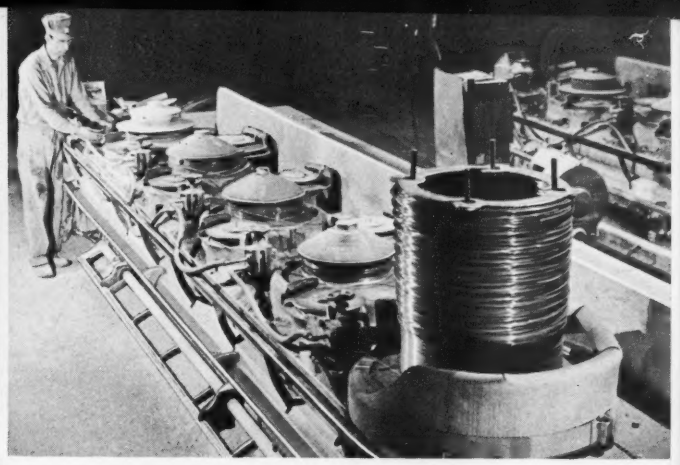
THE VAUGHN MACHINERY CO. • *Cuyahoga Falls, Ohio*

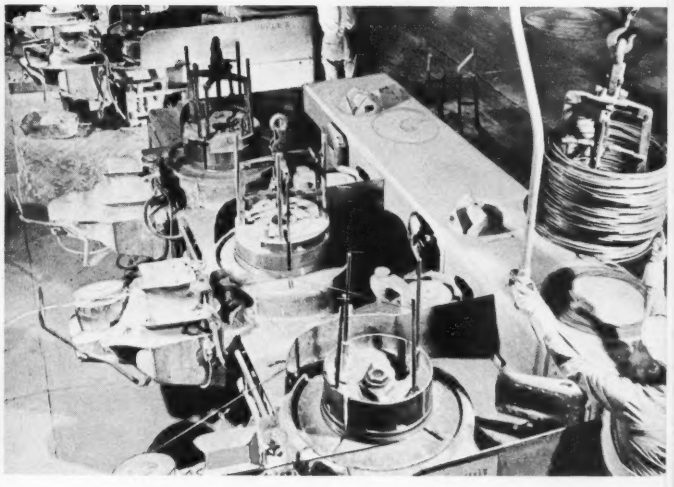
N *Pittsburgh*, AT THE ANNUAL MEETING OF

THE WIRE ASSOCIATION, YOU'LL SEE THESE AND OTHER...







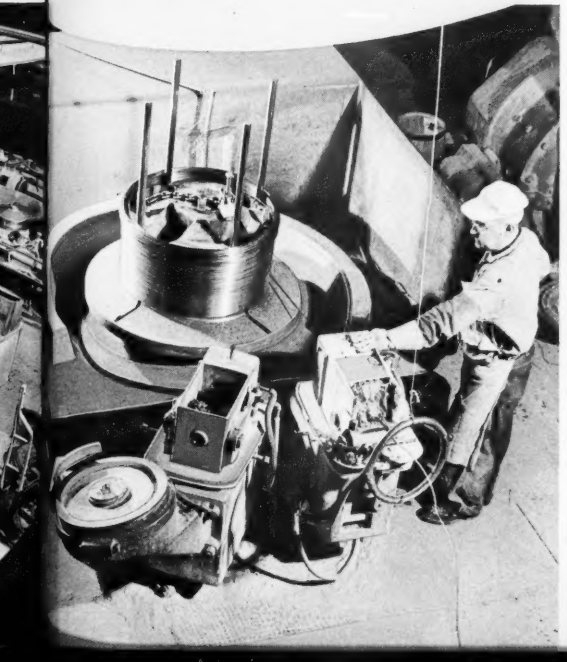


Vaughn

WIRE DRAWING MACHINES

IN THE PLANTS OF-

PITTSBURGH STEEL



A highlight of the Wire Association's meeting in Pittsburgh, October 29 - November 1, is to be the Plant Tour of Pittsburgh Steel Company's Monessen Works. In "Pittsburgh Steel's" busy wire department, the high productivity of Vaughn Wire Drawing Machinery* will be on impressive display—be sure to make this tour an essential part of your personal program!

***The original four (4) of the forty-three (43) Motoblox® in Pittsburgh Steel's Monessen Plant have been in operation for over twenty years.**

JAMES ALEXANDER VAUGHN

1829-1889. Born in Mercer, Pa. Public school education. Apprenticed in the machinist's trade at 16. Worked in Ohio, Illinois and Iowa as a machinist, coming to Cuyahoga Falls in 1856 to join new partnership that was to become Turner, Vaughn & Taylor. Became general manager the following year and a principal owner in 1875. Firm became a corporation in 1889.

CALVIN W. VAUGHN

1858-1929. Cuyahoga Falls High School graduate. Entered Company as apprentice machinist, serving as machinist subsequently until becoming plant superintendent. In 1880's handled engineering and sales. Purchased other partners' interests in 1895 following the death of his father, and headed firm until passing in 1929.

THE Vaughn MACHINERY COMPANY

...a Century of Family Management

LELAND A. VAUGHN

1883-——. Kenyon College, class of 1904. Following post-graduate study at Cornell, joined Vaughn firm in 1906. He became vice president and general manager in 1920, at which time the organization's name was changed from The Turner, Vaughn and Taylor Co. to The Vaughn Machinery Company, and assumed the presidency of the Company upon his father's death in 1929, serving in this capacity until June, 1954, when he became chairman of the board.

JAMES A. VAUGHN

1916-——. Cornell University, class of 1938. Great-grandson of the founder, joined family company in 1940, after work in engineering with Wickwire Spencer Steel Co. in Buffalo. Became vice president and general manager in 1942, and was elected president of The Vaughn Machinery Company in 1954. His brothers, Allan and Gordon C. Vaughn, are secretary and vice president, respectively, of the firm.

THE VAUGHN MACHINERY COMPANY

CUYAHOGA FALLS, OHIO, U.S.A.

COMPLETE COLD DRAWING EQUIPMENT—Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

The Progress of the Properzi Process

by Frank R. Nichols, President
Nichols Wire & Aluminum Company
Davenport, Iowa

Mr. Nayar's paper provides a very clear exposition of the Properzi Process, so that in order to provide for discussion time, my comments will be brief.

★ ★ ★

It is interesting to note that the Properzi Process for the continuous casting and rolling of aluminum redraw rod is the most widely used continuous casting and rolling process in the world. An analysis of the table, Figure 1, will show that there are 19 units in operation in the world; 3 are being installed and 2 mills will be delivered in the near future. All of these installations are and will be operated on the production of aluminum EC grade redraw rod.

★ ★ ★

When it is considered that this progress, in what has been considered a most occult metallurgical field, has been made in but a few years, the significance of the accomplishment of **Ilario Properzi** is made clear.

★ ★ ★

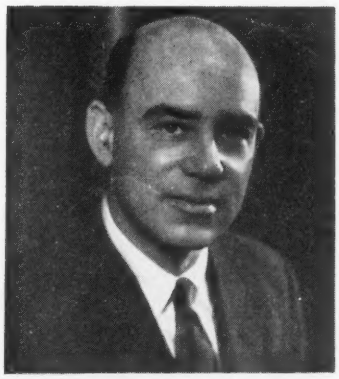
A conservative average production time figure for each of these mills is an output of 2,000 pounds per hour, so that figured in this manner, there now exists Properzi equipment located all over the world with a total capacity of 38,000 pounds of aluminum per hour that soon will be augmented to 48,000 pounds per hour. This figure exceeds by a comfortable margin the individual output of any of the largest conventional type rolling mills. All rod and wire produced by these mills is meeting all applicable specifications.

★ ★ ★

Insofar as the production of zinc rod and wire is concerned, the Properzi Process accounts for most of the growing world production.

★ ★ ★

I should like now to draw your attention to a most interesting layout, Figure 2, that shows a Type 6 installation engineered for use in conjunction with wire drawing machines.



Frank R. Nichols

This paper was prepared for presentation at the Annual Convention of the Wire Association in Pittsburgh on October 30, 1956. **Mr. Nichols is a graduate of the University of Missouri. He worked successively as a salesman for the Quam-Nichols Co., Chicago, the Nichols Wire, Sheet & Hardware Co. in Davenport and the Pittsburgh Steel Co. in Pittsburgh, and in 1942 headed the Material Shortage Department of Bethlehem Steel Co. After a tour of duty with the Material Coordinating Agency for the Government, he joined the Nichols Wire and Steel Co. as Vice President and the following year, 1945, was elected President. The name of the company was changed to Nichols Wire & Aluminum Co. in 1948. He is a director of the Fairchild Engine & Airplane Co. and of Howard Welded Buildings, Inc., in addition to being with many other activities.**

★ ★ ★

The Type 6 equipment represents Properzi's latest improvements in his Process. Basically, the improvements are that the cross-sectional area of the casting is larger than that produced on the 5 and 5A models and that the rolling mill is much heavier, utilizing all thirteen stands to produce ⅜" diameter rod.

★ ★ ★

The cross-sectional area of the 5A casting is 1.2 square inches, whereas the cross-sectional area of the casting produced by the Type 6 equipment is 1.5 square inches (Figure 3). This permits, because of the substantially larger groove in the ring mold, visual observation of the molten pool within the wheel, which makes for better casting control.

★ ★ ★

The larger cross-sectional area also permits the submerging of the tip of the spout in the visible molten pool of aluminum, which eliminates cascading, the formation of oxide and cold-shuts.

★ ★ ★

A previous manner of determining the metal level in the wheel has been by means of interpreting the breaking up of an oil film spread on the steel belt. The pattern of the oil film would be affected by the heat transmitted through the belt, so that there was an indication of the level of the molten metal within the wheel. This manner required considerable adjustment of the rate of the rotation of the wheel to accommodate variations in the flow of the metal from the spout.

★ ★ ★

With the spout submerged in the receiving pool, minor variations are of no consequence, so that the wheel can be rotated at a fixed speed. Such adjustments as are required are made by controlling the flow of metal from the holding pot on top of the machine into the spout by means of a plug gauge or valve.

★ ★ ★

The elimination of the variation of the speed in the emerging casting also minimizes the importance of providing a wide variable speed main mill drive, although a variable speed drive is still required.

FIGURE 1

CONTINUUS — At the date of July 2, 1956

PROPERZI CONTINUUS INSTALLATIONS THROUGHOUT THE WORLD

ALUMINIUM

MONTECATINI	BOLZANO	Italy	Model 5	In operation
MONTECATINI	BOLZANO	Italy	Model 6	Being installed
A.I.A.G.	CHIPPIS	Suisse	Model 4	In operation
GENERAL CABLE CORP.	ST. LOUIS, MO.	U.S.A.	Model 5	In operation
ROME CABLE CORPORATION	ROME, NEW YORK	U.S.A.	Model 5	In operation
ROME CABLE CORPORATION	ROME, NEW YORK	U.S.A.	Model 5	In operation
ROME CABLE CORPORATION	ROME, NEW YORK	U.S.A.	Model 5	In operation
ALUMINUM COMPANY OF AMERICA	VANCOUVER, WASH.	U.S.A.	Model 5	In operation
THE PROOF COMPANY	GOSHEN, INDIANA	U.S.A.	Model 5	In operation
SOUTHWIRE COMPANY	CARROLLTON, GA.	U.S.A.	Model 5A	In operation
SOUTHWIRE COMPANY	CARROLLTON, GA.	U.S.A.	Model 6	Being installed
NICHOLS WIRE & ALUMINUM CO.	DAVENPORT, IOWA	U.S.A.	Model 6	In operation
LA CONSOLIDADA, S. A.	MEXICO CITY, MEXICO	Mexico	Model 6	In operation
PECHINEY	ST. JEAN	France	Model 5	In operation
PECHINEY	ST. JEAN	France	Model 6	In operation
UGINE	VENTHON	France	Model 5A	In operation
ALUMINIO ESPANOL	SABINANIGO	Spain	Model 5A	In operation
ALUMINIO IBERICO	ALICANTE	Spain	Model 5	In operation
ABERDARE ELECTRIC CO.,LTD.	DUBLIN	Ireland	Model 6	In operation
JAMES BOOTH	BIRMINGHAM	England	Model 6	MILL-In operation(Alloys)
ALUMINIUM INDUSTRIES,LTD.	KUNDARA	South India	Model 5A	In operation
ABERDARE CABLES AFRICA,LTD.	PORT ELIZABETH	South Africa	Model 6	Being installed

NEXT DELIVERIES

ENDASA		Spain	Model 6	To operate on Aluminium
ELEKTROKOPPAR		Sweden	Model 6	To operate on Aluminium

ZINC

REAL COMPANIA ASTURIANA DE MINAS	AVILES	Spain	Model 5A	In operation
ILT	LECCO	Italy	Model 2	In operation
MONTEVECCHIO	MARGHERA	Italy	Model 3	In operation
VIEILLE MONTAGNE	ANGLEUR	Belgium	Model 3	In operation
VIEILLE MONTAGNE	ANGLEUR	Belgium	Model 4	In operation
VIEILLE MONTAGNE	BRAY ET LU	France	Model 3	In operation
ENFIELD ROLLING MILLS		England	Model 3	In operation
MATTHIESSEN & HEGLER ZINC CO.		U.S.A.	Model 5A	In operation

NEXT DELIVERY

VIEILLE MONTAGNE	BRAY ET LU	France	Model 5A	To operate on Zinc

The layout, as depicted, for the Type 6 machine provides that the output of rod is collected in a basket, which is set slightly off the horizontal about four or five feet above floor level. Rod is coiled up within the basket, and then convenient amounts are dropped until a pile of rod of approximately 1100 to 1300 pounds has been accumulated. This rod is then transferred behind wire drawing machines but the rod is not cut so that a large reservoir of joined rod bundles is accumulated.

★ ★ ★

The wire drawing machines strip the rod bundles over idler pulleys and thus wire on spools is continuously produced from molten metal.

★ ★ ★

I am convinced that this represents the ultimate in efficiency. This brilliant and simply achieved conception was developed by the Aberdare Electric Company, Ltd. in Dublin, Ireland where it is most successfully operated.

★ ★ ★

The stated capacity of the Type 6 machine is 3300 pounds per hour, but I am optimistic with respect to this figure, which I believe to

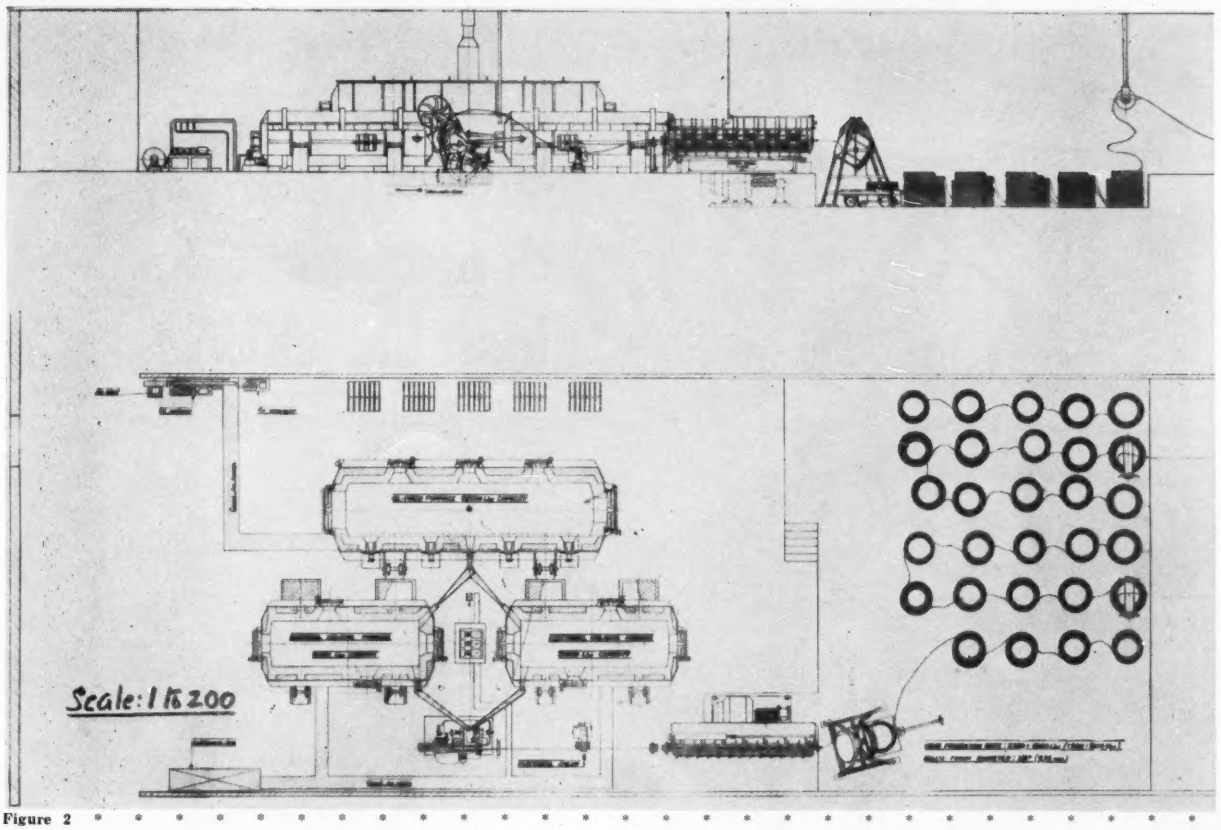


Figure 2

be conservative, since we have exceeded it by a good margin on occasion and we could do so continuously had we a sufficient metal supply.

★ ★ ★

I should like to point out that the layout indicated provides for a substantial supply of treated molten metal.

This particular layout shows an oil-fired melting furnace of 22,000 pounds capacity, which pours into 2 10,000-pound electrical resistance holding furnaces. The holding furnaces are poured alternately into the casting machine. At 3300 pounds per hour, there are approximately three hours of time in the holding furnace, during which time the metal can be fluxed, skimmed and allowed to lie idle for settling. The output of the furnace setup has been calculated by Aberdare Electric to provide 8,000 pounds of metal every 2 hours, so that this layout provides a sufficient reservoir of molten metal to operate the Type 6 equipment at capacity.

★ ★ ★

The holding furnaces, at 10,000 pound capacity, may be considered by some to be unnecessarily large, since conservative metallurgical opinion, here and abroad, holds that settling time of an hour, or an hour and a half, is sufficient. However, this additional capacity provides a margin of time that occasionally is useful; particularly if one furnace is down or in trouble.

★ ★ ★

Before closing, I should like to direct your attention to the fantastic growth of the production of electrical energy. Every ten years the existing supply doubles. Thus, the world has now more than

(*Please turn to page* 1262)

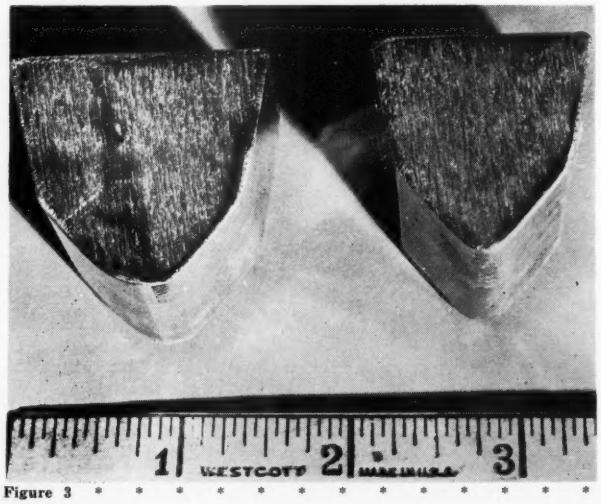


Figure 3

Story of a contractor who lost his shirt

(or why use ELGIN Diamond)

Once upon a time there was a contractor. He was a good contractor. He worked hard, knew his business, did all the things that help pile up the bucks. This contractor built houses, hotels, highways, anything . . . and that meant concrete. Why, he used so much concrete it just wasn't funny.

One day, a salesman from a new kind of company called on our contractor and tried to sell him "ready-mixed" concrete.. "Ready-mixed" concrete . . . now wasn't that a silly thing? Why, he'd been mixing his own concrete for nigh onto 20 years. Why change now? "Ready-mixed" . . . ridiculous.

Well, as it happened, the same salesman called on some of Mr. Contractor's competitors and they thought "ready-mixed" concrete was great, tremendous, terrific. They found there was no waste, it was convenient and even saved them money. It wasn't long before friend contractor lost his shirt. Sad? Yes . . . if only he had *tried* "ready-mixed".

Today, there's a "ready-mixed" type of diamond abrasive on the market called Elgin Diamond. Lots of companies use it—some don't. Those that do have found that with Elgin Diamond there's no bothersome mixing or special grading, no costly waste or chance for error. They also found that because diamond particles are permanently suspended in a specially formulated, color-identified vehicle, they get consistent polishing results.

We're not saying you'll lose your shirt if you don't use Elgin Diamond. We are saying you owe it to yourself and your company to try Elgin Diamond. You can get all the facts by writing.

ABRASIVES **DIVISION**

Dept. G

ELGIN NATIONAL WATCH COMPANY

ELGIN, ILLINOIS

Drawing Quality Aluminum Wire

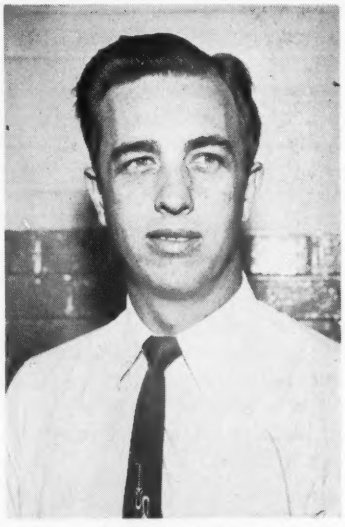
by

O. L. Burtenshaw
Senior Metallurgist

and

Richard E. Hutchinson
Wire Drawing Superintendent

Rod, Bar, Wire and Cable Departments
Kaiser Aluminum and Chemical Corporation
Newark, Ohio



O. L. Burtenshaw

This paper was prepared for presentation at the Annual Convention of The Wire Association in Pittsburgh, Pa., on October 31, 1956.

Mr. Burtenshaw graduated from Gonzaga University in 1950 with a B. Sc. in Chemical Engineering degree. He spent nearly two years in the Kaiser Sheet Mill in Spokane and was transferred to Newark in 1951 where he is Senior Metallurgist, with responsibilities in the Rod, Bar, Wire and Stranding Departments.

Mr. Hutchinson graduated from Purdue University in 1949 with a degree of B. Sc. in Mechanical Engineering. He joined Kaiser at Newark in 1949 and has responsibilities in rolling bar and rod and in wire drawing.

Richard E. Hutchinson

Introduction

The art of wire drawing has been practiced for centuries. Refinements of drawing practices have permitted the quality drawing of metals and improvement of production methods. Aluminum drawing in comparison with the drawing of other metals varies because of the inherent differences of aluminum in comparison with copper and iron or steel. Aluminum is softer, lighter, works easily and yet is more prone to mechanical damage both in the drawing operations and handling. This paper covers some practical aluminum drawing suggestions gained from our own production experience and from contacts with other manufacturers drawing aluminum.

I

Most wire production from aluminum starts with $\frac{3}{8}$" diameter rolled redraw rod. Table I illustrates typical area reductions which may be made on 3/8" diameter rod prior to an anneal performed to soften the wire for additional working or a heat treatment to harden for a particular application. The starting rod temper listed is that most frequently used in the majority of applications. Adherence to the minimum reduction limit is necessary to insure a desirable fine grain upon recrystallization during anneal or heat treatment. The exact maximum reduction which may be made depends on the level of mechanical properties of a particular coil, the surface condition of the rod, lubrication and particular drawing conditions present. It will sometimes be found that on a particular lot of rod the listed reductions may be exceeded and subsequently other lots of rod will not take the same reduction. As with any manufactured product, certain normal variations exist and the drawing practice must be adjusted to give satisfactory results with all rod of normal quality. Generally it will be found that the maximum reductions listed may be exceeded following the anneal after a breakdown draw.

Table I
Typical Area Reductions for 3/8" Diameter Rod

Alloys	Reductions
2024-0	25-50%
2017-0, 2014-0	20-65%
5056-F, Alclad 5056-F, 6061-F	20-80%

★ ★ ★

As aluminum is softer than many other common metals, careful handling is more important than in handling harder metals since ordinary surface abrasions are never completely "drawn out." Figure 1 illustrates the method of storing rod used at our Newark Works. Handling of the rod to the storage area is ordinarily done with smooth booms on fork-lift trucks which are preferably lined with hard wood where the boom contacts

the rod. If the rod is handled manually, adequate protection of the floor is especially important. Cardboard or plywood strips are often used for floor protection. We strongly recommend that storage areas be indoors and that the rod be kept away from open doors where the coils might be exposed to moisture. Water will sometimes produce an abrasive white surface deposit and may even cause serious corrosion of heat-treatable alloys in the "F" or "O" tempers. Note in Figure 1 that the stacks of coils are nearly vertical and that the floor is covered with plywood. Similar handling precautions should be observed when removing the rod from the storage areas.

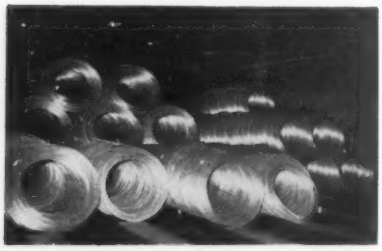


Fig. 1—Rod Storage Area. * * * * * *

II

Drawing quality aluminum wire is dependent upon quality of the rod entering the machine, proper conditions within the machine, and proper take-up of the finished drawn wire. Several methods of pay-off are in common use which are quite adequate. The two basic types of pay-off assemblies used at the Newark Works are illustrated in Figures 2a and 2b. The horizontal pay-off from a hairpin is the most common (See Fig. 2a). Pay-offs must be well protected at all wire contact points with hard wood or fiber. Interstrand scratching with the swift type of pay-off makes a hairpin preferable. On rod sizes larger than ⅜" diameter a rotating swift is generally used, and the arbor and flanges of the rotated swift should be protected with wood or fiber. A lubricant applied to the coil prior to pay-off will prevent some interstrand galling. As illustrated in Figure 2b, wire or rod should pay-off from the top of the coil.

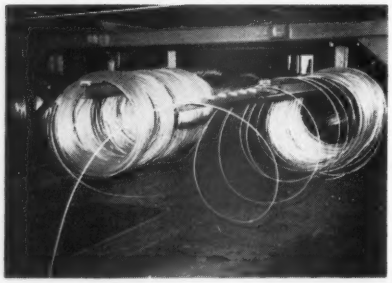


Fig. 2a—Horizontal Pay-off. * * * * *

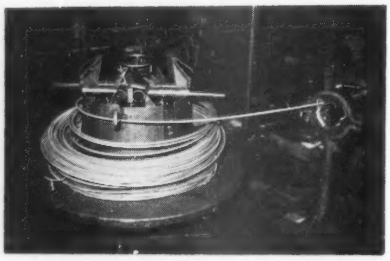


Fig. 2b—Swift Pay-off. * * * * * *

The point of entry into a drawing machine is a common source of damage to the rod or wire. In the right side of Figure 2b is a fiber do-nut guide used at Newark Works to center the rod or wire entering a machine. Following this guide the rod or wire passes through rollers made of fiber. Any material may be used for the guides provided it is softer than the metal being drawn. Laminated fiber and hard wood have proven very satisfactory. Steel rollers, even though they turn freely, will frequently build up with aluminum and have the further disadvantage of causing serious damage should they fail to turn freely. All points in a drawing machine where the aluminum may rub must also be properly protected.

★ ★ ★

Drawing lubricants for best results consist of a good mineral oil plus a lubricity additive of lard oil or tallow with an operating temperature of 90°F to 110°F. Viscosities in a range of 2200 to 2500 SSU. at 100°F. give best results for all finish sizes down to the fine wire drawing operation. Lubricants with 100 SSU. viscosity and containing lard oil are used for fine wire. Water on wire or rod entering a machine must be avoided. Water prevents the lubricants from being effective, resulting in die wear and scratches on the drawn product.

★ ★ ★

Die design for drawing aluminum is similar to that for drawing other metals but is considerably more critical. A typical drawing die is illustrated in Figure 3 for sizes where a 16° included approach angle is recommended. Previous papers have described the generally used die angle for the various sizes. Exceeding the recommended angles can cause cuppy wire as can use of shorter than recommended bearing length. In the approach of a die where the entering rod or wire first makes contact, wear progresses more rapidly than in other die-metal contact areas. If allowed to progress too far, the ring formed will produce die scratches. Also, badly ringed dies are more difficult to polish and in removing severe rings the nib carbide is wasted. A very important source of wire defects is insufficient blending at the three points illustrated in Figure 3. It is preferred that the bell section blend with the approach as a smooth curve.

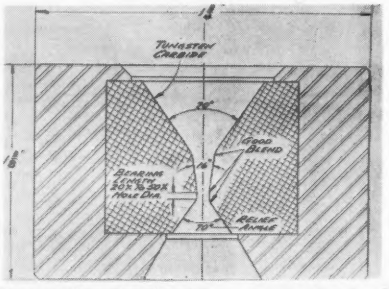


Fig. 3—Wire Drawing Die. * * * * *

For the purpose of this paper, proper thermal treatments are assumed. In connection with annealing aluminum, precautions must be exercised to prevent excess lubricant from remaining on the wire and burning to carbon residue during annealing cycles. During subsequent drawing of wires with burnt lubricants, proper lubrication is prevented and die galling results. Wires going to anneal should be as clean as possible and should contain only the normal oil film remaining after passage through the die. Where oil is a definite problem, higher annealing

(*Please turn to page* 1259)

The Use and Selecting of Wire For Thermocouples

by Marvin R. Danielson, Research Engineer
and Raymond E. Thompson, Plant Manager
Claud S. Gordon Company
Richmond, Illinois

This paper was prepared for delivery at the Annual Convention of The Wire Association in Pittsburgh, Pa., on October 29, 1956.

The science of pyrometery is essential to modern industry. While there are several entirely different methods of determining and controlling temperatures, the thermocouple is the most widely used method because of its readily adaptable characteristics in most applications, wide temperature range, and economy.

★ ★ ★

Certain phenomena discovered by **J. T. Seeback** in 1821 established the fact that a definite temperature electromotive force relationship exists in dissimilar metals. He pointed out that both the hot and cold junctions must be considered when applying this fundamental principle. This law of physics is the basis on which the thermocouple method of pyrometery was developed. The electromotive force being the power that drives calibrated instruments which give direct temperature readings.

★ ★ ★

Classically, the thermocouple is usually defined as being two dissimilar metals welded together. Generally, for industrial use the dissimilar metals are in the form of wire, wire being the most practical and economical means of meeting the requirements of the basic theory.

★ ★ ★

Applications of the thermocouple range from sub-zero temperatures for refrigeration control, such as the freezing conditioning of some tool steels through the intermediate requirements of plastic extruding and molding, steam and diesel engines, agricultural, chemical processing, and refining up to the higher temperature ranges typical of casting, forging, and steel making.

★ ★ ★

The problem of meeting this varied demand for precision pyrometery was resolved by the fabricators of thermocouples and pyrometers and the users by gradually standardizing on four thermocouple alloy combinations to encompass the temperature and atmospheric conditions encountered. The metals most adaptable and standardized on are Copper-Constantan, Iron-Constantan, Chromel-Alumel, and Platinum-Platinum 10% or 13% Rhodium. Wire is available in all of these metals.

★ ★ ★

Selecting the thermocouple alloy best suited for a given condition is a problem which in the past required a study of the metallurgical behavior of the thermocouple materials in the conditions in which it would be used. Many times this was accomplished by trial and error. At the present time most of the fabricators of thermocouples publish tables similar to Figure 1, which is an excellent guide to the initial selection of a thermocouple.

T/C ALLOY	RECOMMENDED TEMP RANGE T/C PROTECTED	RECOMMENDED FOR USE IN FOLLOWING ATMOSPHERES
COPPER-CONSTANTAN	-300 TO +700°F	MILDLY OXIDIZING AND REDUCING
IRON-CONSTANTAN	0 TO +1400°F	REDUCING OR NEUTRAL
CHROMEL-ALUMEL	0 TO +2300°F	OXIDIZING OR NEUTRAL
PLAT-PLAT. & RHODIUM	0 TO +2700°F.	COMPLETE PROT. FROM ALL ATMOSPHERES REQUIRED

FIGURE "1"

These thermocouples represent those recommended by the Instrument Society of America for industrial use and are by far the most widely used. There are however, other alloy combinations available which should be given consideration when selecting the proper thermocouple.

★ ★ ★

The Instrument Society of America has further encouraged the standardization of the thermocouple by adopting recommended calibration curves as shown in Figure 2 for each of these material combinations.

★ ★ ★

The response of these material combinations illustrates another facet connected with the thermocouple, namely, the measurement of the electromotive force output. For accurate measurement a null-point potentiometer or high resistance millivolt meter instrument should be used due to the small magnitude of the electromotive force output. A thermocouple material which would produce a considerably higher voltage for a given temperature would be very desirable, for the measuring problem would be greatly simplified. The curves indicated in Figure 2 are derived from the algebraic additive effect of electromotive force temperature relationship of the individual parts, when referred to a common electromotive force reference known as platinum 27, as shown in Figure 3. Platinum 27 is the standard measuring reference used by the National Bureau of Standards.

★ ★ ★

Calibration of standardized ther-

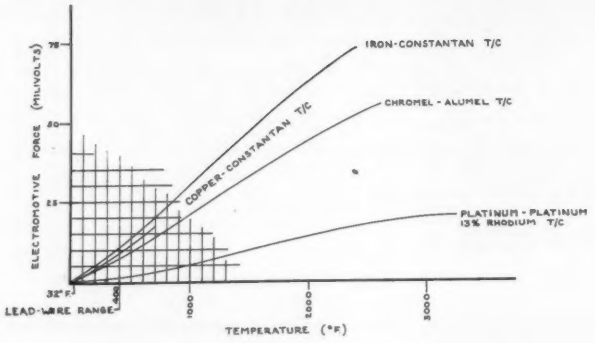


FIGURE "2"

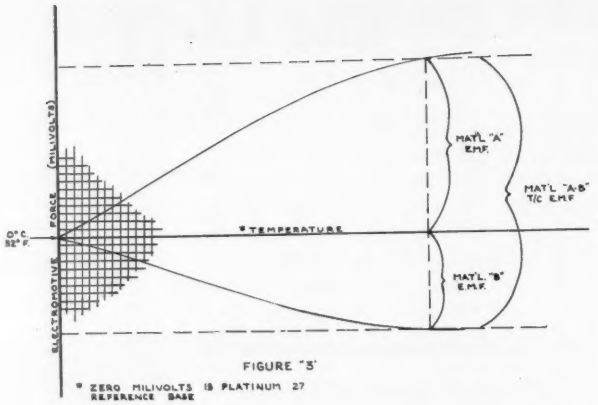


FIGURE "3"

* ZERO MILIVOLTS IS PLATINUM 27 REFERENCE BASE

mocouples therefore, resolves to establishing rigid specifications for the component thermocouple materials in a manner such that, when furnished to the consumer as a thermocouple, it will properly follow the recommended curves within certain accepted tolerances. This has required the fabricator to incorporate extensive quality control methods.

★ ★ ★

These essential methods are achieved by means of a technically competent laboratory, adequate records of the thermoelectric performance of all material used in fabrication coupled with a production organization cognizant of the importance of matching materials as directed. The basic laboratory equipment required would be a heat source in the form of a laboratory type furnace, a stabilized cold junction, a high quality pyrometer controller with anticipating features, and a measuring device, usually a precision type potentiometer with accuracies of about .02% in the microvolt region.

★ ★ ★

The standardization program has enabled customers to purchase instruments and accessories from any source with confidence, for they are assured, when purchasing to I.S.A. specifications, of obtaining within certain limitations products of equal performance.

★ ★ ★

Through research programs, alloy manufacturers, principally those of constantan, chromel and alumel have been instrumental in assisting thermocouple fabricators in meeting these performance standards. Materials such as these are furnished to specifications and the techniques have been refined to a degree that slight changes in analysis will produce a material whose thermo-electromotive force relationship will very closely follow a predetermined curve. The standard specified analysis for these alloys are for Constantan: 55% Cu—45% Ni; for Chromel P: 90% Ni — 10% Cr; for Alumel: 95% Ni — Balance Si, Mn, Al.

★ ★ ★

Copper, another basic thermocouple material, is also readily obtainable, commercial grades in general satisfying the requirements of the industry. The noble metals, as used in thermocouples, are refined to exacting standards and rarely present a calibration problem to the thermocouple fabricator.

★ ★ ★

Iron, due primarily to the small portion used for thermocouples as compared to the total manufactured for other uses, presents the most complex phase of thermocouple fabrication. Until 1953, with the National Bureau of Standards publication of Research Paper No. 2414 not too much was generally known about the relationship of iron analysis to the resultant thermo - electromotive force response. Prior to this time, selecting iron for thermocouple use resulted in comprehensive tests and extensive searching through numerous heats of iron to find one which would be considered acceptable. Presently some iron wire suppliers have indicated more interest in this field and are formulating more precisely to meet this need and this has somewhat reduced the work involved in selecting the proper heat and also enables the fabricator to supply an improved, closer tolerance Iron-Constantan thermocouple.

★ ★ ★

Thermocouple wire of necessity, therefore, is relatively expensive and for economic reasons another grade of wire known as extension wire is produced to minimize installation cost. The function of extension wire is to connect the thermocouple to the instrument and generally is of the same material as the thermocouple, the notable exception being platinum. Extension wire is only required to follow the response curve, as shown in Figure 2, in the lower temperature ranges. Electrical considerations attendant with instrumentation, requiring minimum external resistance to the instrument, are satisfied by the extension wire which is usually made of 14 or 16 gauge material.

★ ★ ★

Both the thermocouple and the thermocouple extension wires require some form of insulation. Discussing this subject will not be attempted in this paper, however, it is noteworthy to point out that numerous standard constructions are available utilizing materials such as fiberglass, asbestos, cotton, plastics, silicones and wax compounds.

Continuous Production Electroplating of Tin on Copper Wire Using Alkaline Potassium Stannate Bath

by

M. K. Schurter
Development Engineer
Federal Wire & Cable Co., Ltd.
Guelph, Ontario, Canada

and

R. T. Gore
Market Development Engineer
Metal & Thermit Corporation
Rahway, New Jersey

A paper prepared for presentation at the Annual Convention of the Wire Association in Pittsburgh, Pa., on October 31, 1956.

Mr. Schurter is a graduate of the University of Toronto, from which institution he received a degree of B.A. Sc. in Electrical Engineering. He became associated with Federal in 1948 and has worked in both the plant engineer's and the chief engineer's departments.

Mr. Gore received a degree of B.S. in Electrochemical Engineering from the Pennsylvania State University in 1934. After two years of graduate study he taught physical chemistry at the University of Pennsylvania. He joined Metal and Thermit in 1951, where he has been concerned with electroplating, specifically tin and tin alloy plating.

M. K. Schurter

R. T. Gore

This paper is being presented to pass along to all those interested, particularly to wire manufacturers, the knowledge that has been gained from experience in the use of the potassium stannate bath for continuous electro-deposition of tin on copper wire. It also compares this method with the older hot dip method.

As most of the production is for use as electrical conductors, the Federal Wire and Cable Company tins copper wire for one or more of the following reasons:

(1) To minimize corrosion of the copper due to atmospheric conditions.

(2) To protect the copper from insulating materials whose ingredients will attack it and adhere to it, thereby preventing free-stripping of the insulation, and

(3) To facilitate soldering.

★ ★ ★

In the past, the standard method for tinning has been the use of the hot dip method. In the method which we describe, the tin is electroplated on the wire using an alkaline potassium stannate bath. For those who are not familiar with the theory of electroplating, we will review it briefly. As shown

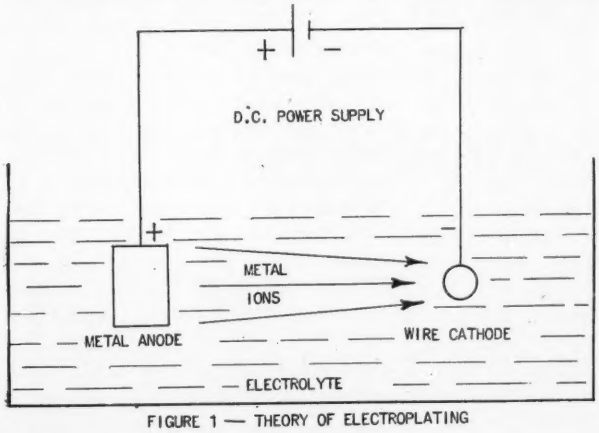
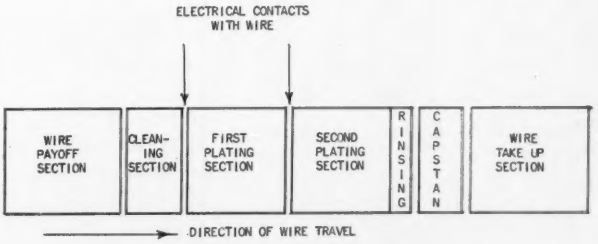


FIGURE 1 — THEORY OF ELECTROPLATING

FIGURE 2



PROCESS LAYOUT FOR CONTINUOUS ELECTROPLATING OF TIN ON COPPER WIRE USING ALKALINE BATH.

in Figure 1, the material to be plated (or cathode) is connected to the negative side of a direct current power supply and is placed in a solution of a salt of the plating metal, called the electrolyte. Into this solution is also placed a piece of the metal to be deposited (or anode) and this is connected to the positive side of the same power supply. As direct current is passed through the electrolyte between the anode and cathode, the metal ions, which bear a positive electrical charge, migrate to the terminal of opposite polarity, i.e., cathode. There they are neutralized by taking on negative electrons, and are deposited on the cathode. Ideally, for every particle of metal that is deposited, a similar particle is released from the anode, as the electrolyte strives to maintain equilibrium. This so-called "dissolving" of the anode makes its replacement necessary. The rate at which plating takes place is affected by the travelling speed of the ions from anode to cathode, and at 100% efficiency, is proportional to the current being passed through the solution.

★ ★ ★

The heart of the plating system is the electrolyte or, as it is more commonly called, the bath. This bath may be either of the acid or alkaline type. When it was decided that electroplating might have advantages over the hot dip system, the Federal Wire and Cable Company investigated the information that was available. The choice, for a production line, was the potassium stannate alkaline bath which is presently plating 4 wires simultaneously.

★ ★ ★

The electroplating machine has five main constituent parts:

(1) Cleaning Section
(2) Plating Section
(3) Final Rinsing
(4) Plating Power System
(5) Wire Line Drive

The process layout is shown in Figure 2.

★ ★ ★

(1) Cleaning section — The wire first passes through a cleaning tank which is 5 feet long and contains a solution of 10 pounds sodium carbonate and 10 pounds sodium cyanide in 75 Imperial gallons of water. Cathodic cleaning is used, which means that the wire is the cathode. The anode is composed of several strips of steel suspended in the solution. Actual cleaning is achieved by the scrubbing action of hydrogen being released at the wire cathode. This removes dirt and other impurities but this method, in this installation, must be supplemented by mechanical means in order to remove copper dust and slivers. This is accomplished by providing tight silicone rubber seals at both ends of the tank. The solution is heated in a reservoir to approximately 140°F and is continuously recirculated through the cleaning tank by an inexpensive centrifugal pump at about 20 gallons per minute. Cleaning tank solution level is held constant by means of an overflow. With the machine operating over a 24 hour day, the solution is replaced daily, being dumped directly into the sewer. One gallon of solution cleans approximately 100 pounds of copper, although this figure will vary with the amount of contamination on the wire.

★ ★ ★

After leaving the cleaning tank, the wire passes through a water rinse which is drained to the sewer.

★ ★ ★

(2) Plating section — Plating takes place in 2 tanks each 10 feet long, electrical contact being made with the wire just before entering each tank. Using 2 tanks, rather than one, permits higher wire speeds and heavier deposits. The plating solution is composed of 1600 pounds of potassium stannate ($K_2Sn(OH)_6$) and 100 pounds potassium hydroxide in 330 Imperial gallons of water. A reservoir is supplied where the solution is heated and maintained at a temperature of 180 to 190°F. The solution, or bath, is continuously recirculated through the plating tanks by a vane type pump at a rate of approximately 20 gallons per minute through each of the two tanks. Overflows are provided on the plating tanks to keep the solution level constant. As in the cleaning tank, the wire passes through silicone rubber seals at entry and exit ends of each tank. Solution drag-out on the wire is removed at the end of each tank by means of a 12 inch rinse section, from which it is returned to the reservoir.

★ ★ ★

"High-Speed"* tin anodes are used to replenish the bath in order to replace the tin that is plated on the wire and are an essential part of the operation. These anodes operate more efficiently than ordinary tin anodes and may be operated at considerably higher current densities. This latter point is important, particularly for the plating of the larger wire sizes, where high plating currents may be used.

★ ★ ★

(3) Final rinsing — It is important to thoroughly wash the plated wire to remove the last traces of plating solution. A water spray at 40 to 50 psi. pressure and approximately 3 feet long is adequate. The water is then dried from the wire by the use of an air jet before it is spooled.

★ ★ ★

(4) Plating power system — The wiring diagram for one heavy and one fine wire line is shown in Figure 3, but the principle is the same for any number of lines. Each wire line is equipped with a separate DC power supply, so that each line can be controlled independently of all other lines. Two of the wire lines are used for the range of sizes 24-14 A.W.G., which are referred to as fine wire lines, and the other two are used for sizes 14-6 A.W.G., and shaped wires, which are referred to as heavy wire lines. The heavy wire lines are also used for the plating of wire for redrawing purposes. Power supply capacity for each fine wire line is 500 amperes at 12 volts and for each heavy wire line 1000 amperes at 12 volts. The 12 volts is more than enough for ordinary plating but is just borderline when heavier coats are applied for redrawing. In this latter case, a 15 volt supply is recommended. For the fine wire lines, the same

* Trade-mark, Metal and Thermit Corporation.

WE'RE PROUD!

—and who wouldn't be . . .

VIEW SHOWING PART OF THE GLADER NAIL MACHINES USED EXCLUSIVELY IN THIS NEWEST OF LARGE WIRE MILLS

Once Again **Glader NAIL MACHINES**

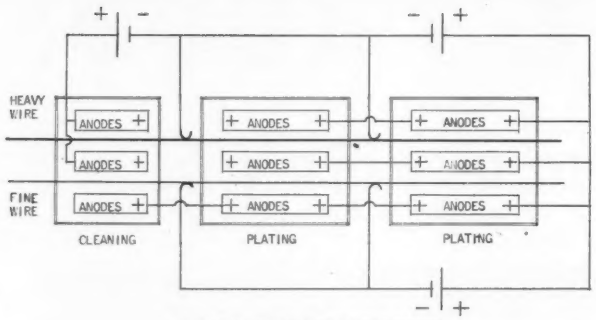
have been chosen *100%*

WM. GLADER MACHINE WORKS

210 N. RACINE AVENUE • CHICAGO 7, ILLINOIS

EXPORT DEPT., 122 EAST 42ND STREET • NEW YORK 17, N. Y.

FIGURE 3



WIRING DIAGRAM FOR CONTINUOUS ELECTRO-PLATING ON ONE HEAVY AND ONE FINE WIRE.

FIGURE 4

TYPICAL PLATING RELATIONSHIPS

SIZE A.W.G.	DIAMETER INCH	WIRE SPEED FT. PER MIN.	PLATING CURRENT AMPS.	TIN THICKNESS MILLIONTHS OF AN INCH
24	.0201	700	125	25
22	.0253	700	150	25
20	.0320	500	150	25
18	.0403	500	170	25
16	.0508	500	210	25
14	.0641	400	250	25
12	.0808	300	300	25
10	.1019	250	350	25
8	.1285	200	400	25
14	.0641	TO 125	250 and higher	260

power supply is used for both plating and cleaning current. Because of the different conductivities of the two solutions, the cleaning current for ordinary plating is about 10 to 15 per cent of the plating current and this is sufficient for fine wire. In the case of heavy wire, more cleaning current is required and should be 20 to 25 per cent of the plating current. In order to obtain this figure higher voltage must be available, than is required for plating, and so separate cleaning power supplies are provided, each being rated at 150 amperes, 15 volts. Each wire is connected to its power supply by means of rotating contacts placed ahead of each of the two plating tanks.

★ ★ ★

The tin anodes in the plating tanks are suspended from insulated copper bus bars which are commonly connected to the positive terminals of the plating rectifiers. The steel anodes in the cleaning tank are suspended from insulated copper bus bars in two groups. The group for the fine wire lines is connected to the common positive terminals of the plating rectifiers, while the anodes for the heavy wire lines are connected to the positive terminals of their separate cleaning rectifiers.

★ ★ ★

Each wire line is completely insulated from the rest of the machine and from ground. Separate control and current changing taps are provided for each wire line, so that individual speeds and deposit thicknesses are obtained.

★ ★ ★

(5) Wire line drive — Each wire line has its own separate drive and foot speed control is obtained by the use of a DC motor driving a capstan which pulls the wire through the machine. The wire is then spooled on a take-up which is driven by a magnetic slip clutch that provides constant tension during reel build-up. Continuous braking on the payoff insures that no sag loops form in the tanks to cause short circuits. The capstan drive features dynamic braking and electric brakes are built into payoff and take-up, so that by means of one master stop button the line can be stopped immediately from full speed when a new reel of wire is to be joined in, or a take-up reel changed. At the same time, a low voltage relay across the capstan motor armature permits plating current to flow until the wire comes to rest, so that no bare spots occur.

Plating Thicknesses

Current density used for normal plating is approximately 800 amperes per square foot of wire surface exposed in the bath. A few examples of speeds, currents, and thicknesses are shown in Figure 4. Wire used for redraw is given an extra heavy coat. In practice, a minimum thickness of 200 millionths of tin is required on No. 14 A.W.G. before redrawing to #30, in order that the #30 will pass the dip test as outlined in ASTM Spec. B33. Actually, the excess of tin required for redrawing, over the theoretical thickness, is determined by the subsequent drawing and annealing operation. It should be noted here that higher plating speeds could be obtained if additional cleaning facilities were provided.

Operating Technique

Cleaning — Wire must be well cleaned in order to prevent formation of a loose tin-coating. The seals at the ends of the tank should be tight in order to remove loose dust and slivers. The value of the cleaning current must be at least 20 per cent of the plating current for heavy wires and 10 per cent for fine wires.

★ ★ ★

Plating bath — There are only two ingredients to control in the plating solution, potassium stannate ($K_2Sn(OH)_6$) and potassium hydroxide (KOH). When initially setting up the plating bath, it is advisable to check the specific gravity and to perform a tin analysis on the solution three or four times a week. After about four weeks, enough information is available to permit control of potassium stannate addition by means of specific gravity check only. However, it is advisable to double check by means of a monthly tin analysis.

★ ★ ★

Analysis for free potassium hydroxide should be taken about three times a week and should not be relaxed. A close check is required for free potassium hydroxide as it is important to have good solution conductivity. This analysis can be performed in about 10 minutes and solution adjustments

(*Please turn to page* 1255)

Introducing the Nailmaker

by Richard J. Fisher
The National Machinery Company
Tiffin, Ohio

This paper was prepared for delivery at the Annual Convention of The Wire Association in Pittsburgh on October 30, 1956.

The Nailmaker is a revolutionary new non-stop high-speed machine. It embodies an entirely new approach to making nails. It is the result of 15 years of research, development and testing, followed by more years of production runs by pilot installations in the mills.

★ ★ ★

Many features of the Nailmaker are suggestions made by many experienced nail mill men who have participated directly in the project. These new features include:

Non-stop, high-speed operation
Twice the ordinary output
Carbide tooling throughout
Quickly interchangeable tooling
All-steel bedframe
Anti-friction bearings
Toggle-operated cut levers
Magnetic conveyor
Power-driven reel
Safety-shutoff controls
Accessible tools
Simple, quick adjusting means
Eccentric crankshaft
One-piece pitman
Over-arm heading slide
Enclosed mechanism.

★ ★ ★

Nailmakers are bringing to the modern mill the benefits of these features which greatly reduce production costs. One-third the number of men can produce the same tonnage in nails with much less physical effort. Carbide tooling is used and the cutters, for example, are redressed only every 25 to 35 million nails (700 hours) which average greatly exceeds that of steel cutters. Since the output per machine is doubled, only half as many machines are required with the resultant savings of floor space.

★ ★ ★

There are many fresh new concepts built into the Nailmaker which will be described in the following discussion. These concepts have now undergone years of proven operation in successful nail mill installations. Although new, more than 60 Nailmakers are now installed. The following facts are based on the routine daily operations of these installations.

★ ★ ★

In one modern mill six operators using Nailmakers are producing the same tonnage that formerly required 18 operators. At the time of this report, the mill was running its Nailmakers three shifts. Other mills also assign ten machines to one man, no helpers, with equally good results.

★ ★ ★

Successes such as this have been assisted by (1) short but concentrated courses of training for nail mill personnel at National, and (2) intelligent preventive maintenance programs in the mills.

★ ★ ★

The new Nailmaker offers a striking departure from ordinary nail machine standards—it is a very rigid machine, built with precision tools and capable of delivering high production.

★ ★ ★

The Nailmaker turns out twice as many nails as conventional machines, while retaining the simplicity of one-wire feed and one-cycle operation. It is manufactured in six sizes—2d, 5d, 8d, 16d, 60d and roofing nail. Product specifications of the 8d Nailmaker are:

Nails per minute, 700
Maximum nail length, 2-½"
Maximum head diameter, 5/16"

★ ★ ★

Operating at high speed with an absolute minimum of stops for tool replacement, adjustment or maintenance, the Nailmaker is nevertheless easy to set up and adjust. A complete tooling change can be made in 20 minutes. Tools, which are set up to gauges, are completely interchangeable.

★ ★ ★

Nailmakers produce nails from coiled wire, completing a nail at each revolution. Any gauge of nail within the capacity of the machine can be made by changing only the gripping dies and feed grips. Various lengths are secured by merely adjusting the feed, and quick-adjusting means are provided for varying the size of the nail head. The length adjustment can be made while the machine is running.

★ ★ ★

Great care has been taken in the design by shrouding bearings and providing ample covers to keep the mechanisms free of whiskers and dirt. Also, the nail discharge chute is designed to separate foreign matter from the nails.

Bedframe

The bedframe is a heat-treated steel casting, rigid and compact, designed for the best possible metal distribution. The bed is further reinforced with a tie-rod at the top of the machine.

Heading Slide

The long, over-arm heading slide, with its hardened and ground V-bearing surfaces, assures long bearing life and accurate alignment of the hammer with the dies. Result? Uniform heads. The slide is exceptionally well guided. Bearing surfaces both at the front and rear are located inside the machine, totally separated from the die box. Conventional cross-heads are necessarily short because they must be located entirely in front of the crankshaft. The Nailmaker's long, over-arm piloted heading slide has an extension

which passes over the crankshaft.

Crankshaft

A full-eccentric-type crankshaft, the strongest, most reliable shaft that can be provided for the purpose is used. The crank is relatively short and is pressure-lubricated for outstanding bearing life. The one-piece pitman used with the eccentric crankshaft further reduces weight of moving parts, important in high speed operation where nonstop endurance runs are essential.

Feed Carriage

The wire passes through the 14-roll wire straightener into the come-along type wire feeding mechanism. Wedge-shaped carbide grips insure positive grip and accurate feeding. The life of these grips is so long that it is expressed in number of months of operation rather than number of nails. When wear does finally reach the point of replacement, the original grips can then be ground and used for the next larger wire size.

Grip

Gripping action is imparted to the bottom die (dies are mounted vertically) through a heavy lever of heat-treated cast steel. A large, steel cam follower at the end of this lever rides a steel cam mounted on the crankshaft.

Cut Levers

Heavy, cast alloy steel cut levers, heat-treated to give them the properties required for long life, pivot on a common center located on the center line of the machine. These levers are operated through a toggle mechanism by the heading slide. When the nail is cut off, the crankshaft is approaching back dead center and the toggles are approaching their center. Thus, while the 8d machine runs 700 r.p.m., the cutters have decelerated to a speed approximately equal to that of 100 r.p.m. machines while cutting off in a slow, powerful manner.

Payoff Reel

Wire is fed into the Nailmaker from an automatically regulated, power-driven reel. The reel is driven by its own electric motor through a variable speed drive. The wire pays out to the Nailmaker at the exact rate required by the machine. Should the wire become tangled on the reel the machine and reel are immediately and automatically stopped.

★ ★ ★

Using conventional reels, two men are required each hour to load wire in front of a machine. However, with the National power-driven reel, high hats are used and loaded with a four-hour supply in the wire room. These high hats are then moved in the nail room and as one high hat becomes empty a loaded one is placed on the pedestal. Formerly the operator shut down every 21,000 nails to reload, but now runs 168,000 nails before reloading.

Tooling

Tungsten carbide tooling is used throughout for cutters, grip dies, hammer and feed grips. The machine is accurately built to a centerline, so tooling, which is previously set up to gauges, is completely interchangeable. Shims are not required.

★ ★ ★

Positive stops in the cut lever arrangement make it possible to set the cutters within an average of three to four thousandths of each other, or to vary this setting to obtain a good cut-off. Cutters will never touch when the machine is running, regardless of whether or not wire is feeding.

★ ★ ★

The cutters used on old-design machines have a flat or land which serves as a kissing surface to protect cutting edges. These quickly peen over and become ineffective, necessitating frequent cutter dressings. However, in the Nailmaker, machine rigidity and the action of the cut-off make these kissing surfaces unnecessary. Cutter life is considerably extended through the positive stop arrangement and the use of carbide.

★ ★ ★

A complete tooling change can be made in 20 minutes. All that is needed to remove the die block is the loosening of two nuts and one side clamp screw. The new replacement block, having already been set up with the aid of fixtures, is ready for quick, simple installation.

★ ★ ★

All that is needed to remove the cutters is to remove two nuts and one clamp.

★ ★ ★

All that is needed to remove the hammer is to remove two nuts and one clamp.

★ ★ ★

The carbide hammer is backed up by a filler and adjustable wedge (which takes the heading pressure) instead of threads on an adjustable sleeve as used on conventional machines. The hammer can be removed without disturbing the die block or the cutters.

Magnetic Conveyor

A magnetic conveyor elevates the nails through an inspection hopper directly into the nail buggy. The hopper can be closed momentarily while buggies are changed. Eliminated entirely is the manual lifting of tote pans.

Safety Shutoffs

The Nailmaker will automatically stop:

(1) at the end of the wire,
(2) if wire tangles on the reel, or
(3) if the wire jams in the feed mechanism.

★ ★ ★

When the machine stops, the red light at the starter station flashes on, calling attention to the operator that the machine has stopped.

Lubrication

A positive pressure type system delivers oil to all bearings. Oil is triple-filtered through a brass oil screen, a magnetic filter and an automobile-type replaceable-cartridge filter.

Tool Costs

The original cost of a pair of tungsten carbide nail dies is about

(*Please turn to page* 1247)

The Effect of Salts in Formvar On the Dielectric Properties of Formvar Alkyl-Phenolic Coated Magnet Wire

by Robert E. Kass and Edward Lavin
Research Department
Shawinigan Resins Corporation
Springfield, Massachusetts

This paper was prepared for presentation at the Annual Convention of The Wire Association in Pittsburgh, Pa., on October 30, 1956.

Mr. Kass graduated from the University of Dayton and holds a masters degree in chemistry from Ohio State University. He worked at Monsanto's Mound Laboratory for five years before starting his research assignment at Shawinigan in 1953.

Mr. Lavin received an MS degree from Tufts College and joined Shawinigan in 1938. In 1949 he was awarded the Shawinigan Academic Leave to go to Harvard University. He is a Section Leader in charge of organic-acetal research, which includes wire enamel and safety-glass interlayer resins.

In a previous paper (1) the production, properties and uses of polyvinyl formal ("Formvar"®), were discussed. One of the most important areas where this synthetic polymer has achieved widespread use is in the field of enameled magnet wire. The basic physical and chemical properties of the resin make it ideally suited for this purpose.

★ ★ ★

When combined with an alkyl phenolic resin, (generally a condensation product of formaldehyde with meta- and para-cresol), and suitably coated on wire, the resulting film has flexibility, abrasion resistance, adherence, solvent resistance and other desirable properties including excellent wet and dry dielectric strength. The influence of salts on this latter property, i.e. wet and dry dielectric strength, is the subject of this paper. This investigation concerns itself only with the trace salts in Formvar and is not concerned with any trace impurities in the modifying alkyl phenolic resin.

★ ★ ★

In the manufacture of Formvar, acetic acid and water are used as a solvent for polyvinyl acetate. Sulfuric acid catalyzes the hydrolysis of this polymer to polyvinyl alcohol and since formaldehyde is also in the reaction mixture the sulfuric acid simultaneously catalyzes the condensation of this formaldehyde with the polyvinyl alcohol to produce the formal resin. Ammonium acetate is the alkaline neutralizer used after the reaction is complete. This neutralization yields ammonium sulfate and leaves some excess ammonium acetate in the resin as well. These salts are carefully washed out of the resin down to trace amounts since their presence in large amounts could adversely affect the dielectric strength of the finished enameled wire.

★ ★ ★

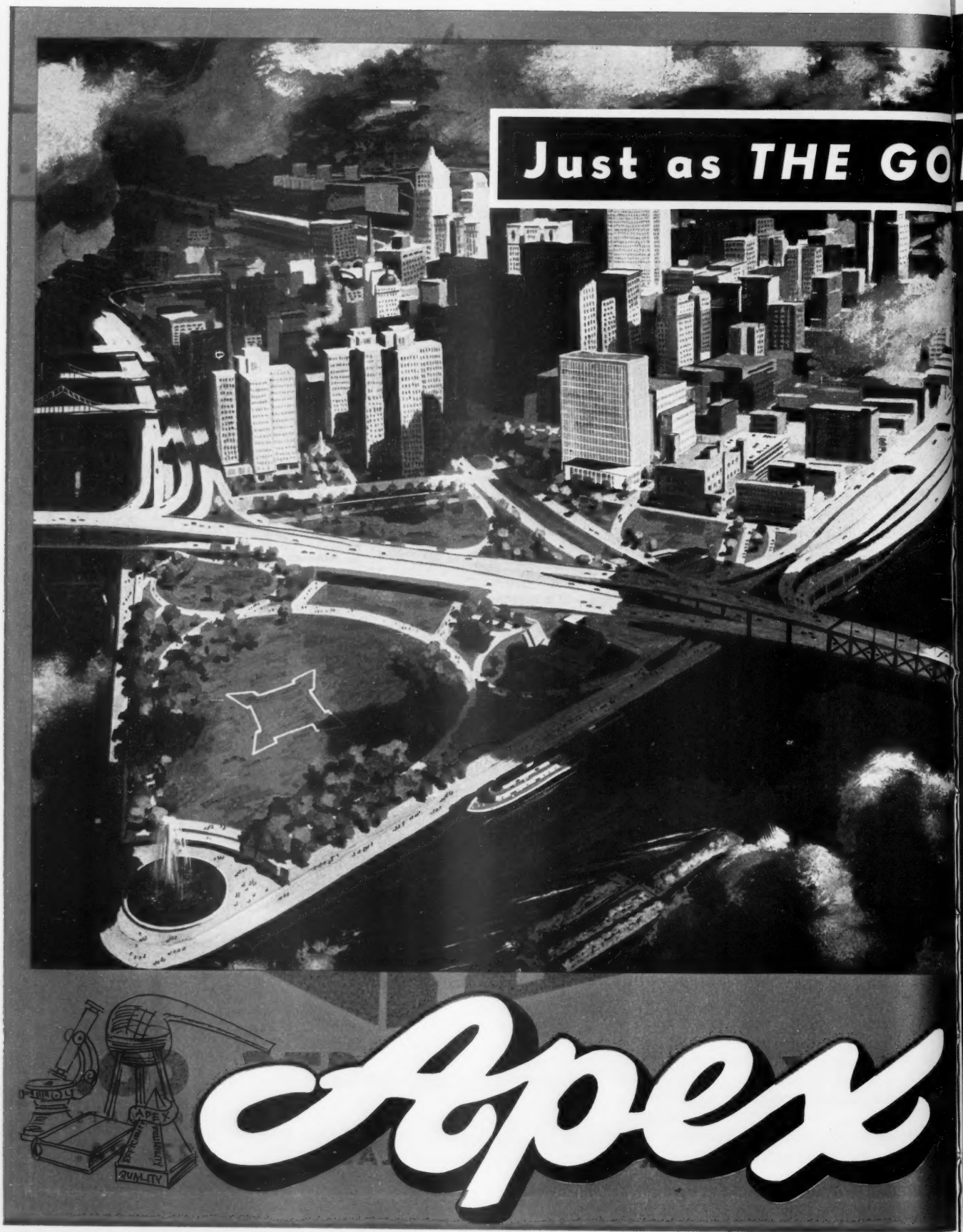
A number of experimental runs designed to test the effects of salts were conducted in the following manner. Wire enamels were prepared with 100 g. Formvar 15/95E. 100 g. Resinox 455B (Monsanto Chemical Co.), 500 ml. Hiflash naphtha and 250 ml. R7B cresylic acid, (both of the latter from Barrett Div., Allied Chemical and Dye Corp.). To these enamels were then added varying amounts of either ammonium acetate or ammonium sulfate, except in the case of controls to which no additional salt was added. In the control runs no attempt was made to remove any trace salts already in the Formvar. The enamels were applied to Number 16 hard drawn copper wire which was electrically pre-annealed and the enamel film was baked in a 12-ft., vertical oven to give a six coat, 1.5 mil thick film. Light (11-ft./min. speed of wire through tower) and dark (9-ft./min.) bakes were run on each experimental enamel.

★ ★ ★

The coated wires were then formed into NEMA twisted pairs (2). Two types of conditioning were used, i.e. "wet" and "dry." The dry samples were desiccated 24 hours and the wet samples immersed in water 24 hours before testing. This conditioning was designed to test the extremes in humidity on dielectric strength. The twisted pairs were placed in an Indiana Technical College Dielectric Tester, Model No. DT3, and subjected to a breakdown voltage increasing at the rate of 500 volts per second until the insulation failed. Except for conditioning, the testing corresponded with NEMA (2) and Joint Army-Navy (3) specifications. Two separate series of salt variation experiments were averaged to give the curves shown on figures 1 thru 4. In these series the Formvar 15/95E used had the following salt content: 0.165 per cent ammonium sulfate and 0.034 per cent ammonium acetate. Only one lot of alkyl phenolic resin 455B was used. Each series consisted of the following variations:

1. Ammonium sulfate—one control run plus four runs with uniformly in-

® Registered Trademark of Shawinigan Resins Corporation.

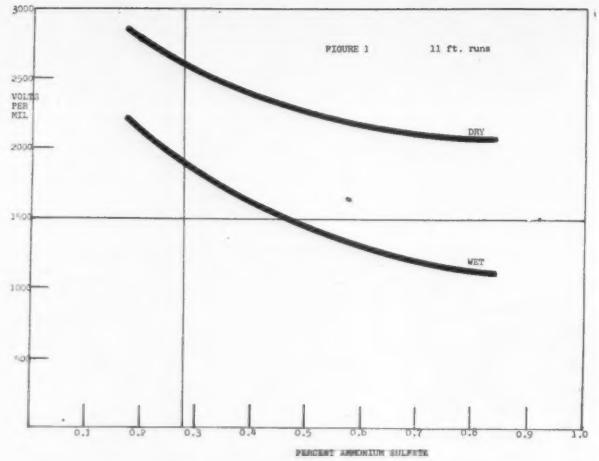

Just as THE GOL
Apex

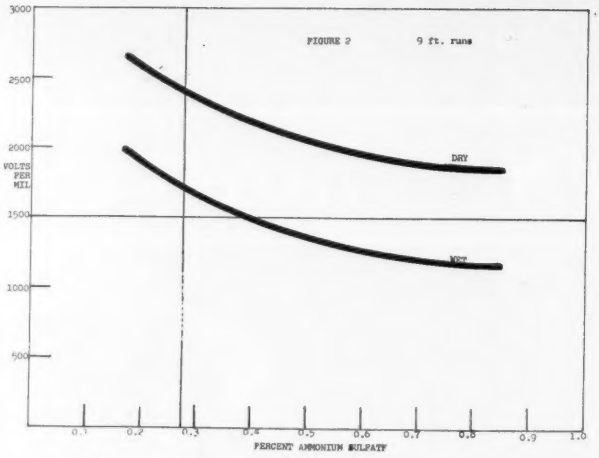
OLDEN TRIANGLE in Pittsburgh. . .
APEX
is famous throughout the country
for growth and achievement - -
so THE APEX TRIANGLE is known as a symbol
of quality throughout the wire industry . . .
now extending its services to include the South.
CONVENTION TIME is a fine time to
gain time for the future. Visit us
at our headquarters at the Penn-Sheraton
in Pittsburgh, October 29 - - November 1.
QUALITY

ALKALI PRODUCTS CO.

OUTSTANDING PRODUCERS OF WET WIRE DRAWING LUBRICANTS

MAIN & RECTOR STREETS, PHILADELPHIA 27, PA.





creasing amounts of ammonium sulfate. The range of ammonium sulfate was 0.165 to 0.85 per cent on the Formvar.

2. **Ammonium acetate—one control run plus four runs with uniformly increasing amounts of ammonium acetate. The range of ammonium acetate was 0.034 to 0.434 per cent on the Formvar.**
3. **Two wire tower speeds at each salt concentration.**

★ ★ ★

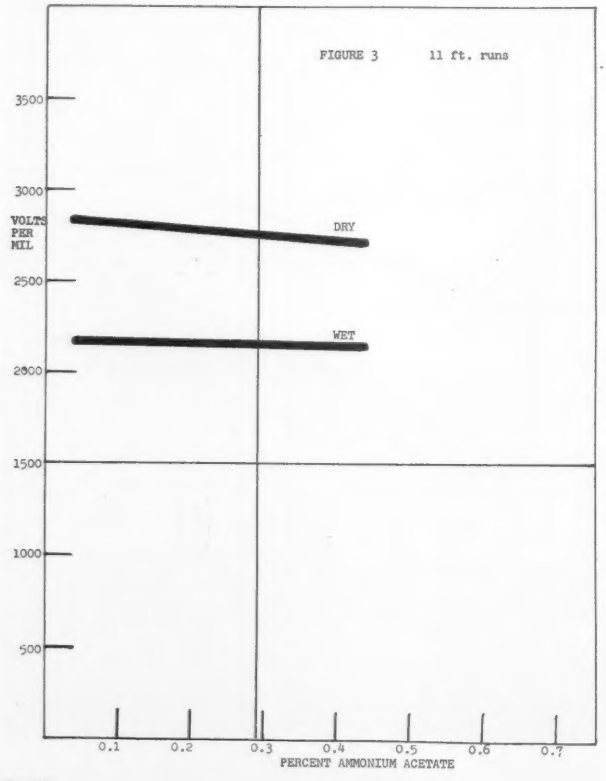
This gave a total of twenty coated wire samples for each series. Twelve twisted pairs then were made from each of these twenty samples; six were tested wet and averaged, six were tested dry and averaged. All the values from these duplicate series were then averaged to give the curves shown. These curves represent the best lines drawn through all experimental points.

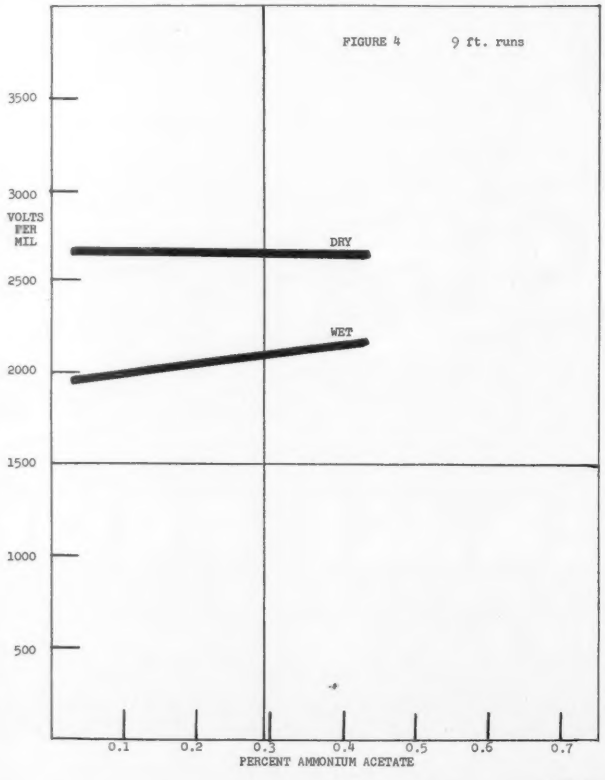
★ ★ ★

The vertical lines on the figures show the present maximum specification limits of salts in Formvar 15/95E; the horizontal lines show the minimum dielectric strength of vinyl acetal-coated magnet wire as specified by the National Electrical Manufacturers Association (2).

★ ★ ★

Figures 1 and 2 show the effect of ammonium sulfate. The extreme left hand end on all curves represent the control runs. It is seen that the dry dielectric strength is not lowered below the 1500 volt/mil line even when the ammonium sulfate content greatly exceeds the specification limits. However, with both degrees of bake the dielectric strength of the wet samples is seen to drop below the 1500 volt/mil value if the ammonium sulfate concentration ex-





ceeds the maximum specification by about 0.1 per cent.

★ ★ ★

Figures 3 and 4 show the results of testing ammonium acetate concentration in Formvar versus dielectric strength. It can be seen that the addition of ammonium acetate within and beyond the Formvar specification limits has no significant effect on either the dry or wet dielectric strength of the film. Although the wet strength is lower than the dry, at no time does there appear any indication of the strength falling below 1500 volts/mil.

★ ★ ★

The drop-off of dielectric strength with ammonium sulfate and not with ammonium acetate may be explained on the basis of the chemical and physical properties of these salts. Ammonium acetate is a very unstable salt and is rapidly volatilized if heated slightly above room temperature. Thus, it seems plausible that during the baking operation in the wire tower (temperatures up to 400°C), the ammonium acetate decomposes completely, so that as such it is not a factor to be considered in dielectric strength. Ammonium sulfate, while more stable than ammonium acetate, is decomposed above 140°C, converting into ammonia and ammonium hydrosulfate.

$$(NH_4)_2SO_4 \longrightarrow NH_3 + (NH_4)HSO_4$$

and many of the reactions attributed to the normal sulfate really refer to the hydrosulfate (4). Since the hydrosulfate is a very stable salt having a reported boiling point of 490°C, it is quite conceivable that this acidic salt is retained in the cured Formvar-phenolic film. This would be a reasonable explanation of the drop-off of dielectric strength of the samples treated with ammonium sulfate. The dielectric strengths of the wet samples were probably lower than the dry samples due to an ionizing effect of the acid salt during water immersion.

★ ★ ★

The deleterious effect of high concentrations of ammonium sulfate makes it necessary to rigidly control this trace salt. Formvar resin specifications call for a maximum sulfate (SO_4) value of 0.2 per cent which is equivalent to a maximum ammonium sulfate value of 0.275 per cent. The sulfate is determined by the Parr bomb method. The maximum allowable nitrogen content present in Formvar is specified as 0.1 per cent NH_3. This is determined by a Kjeldahl procedure.

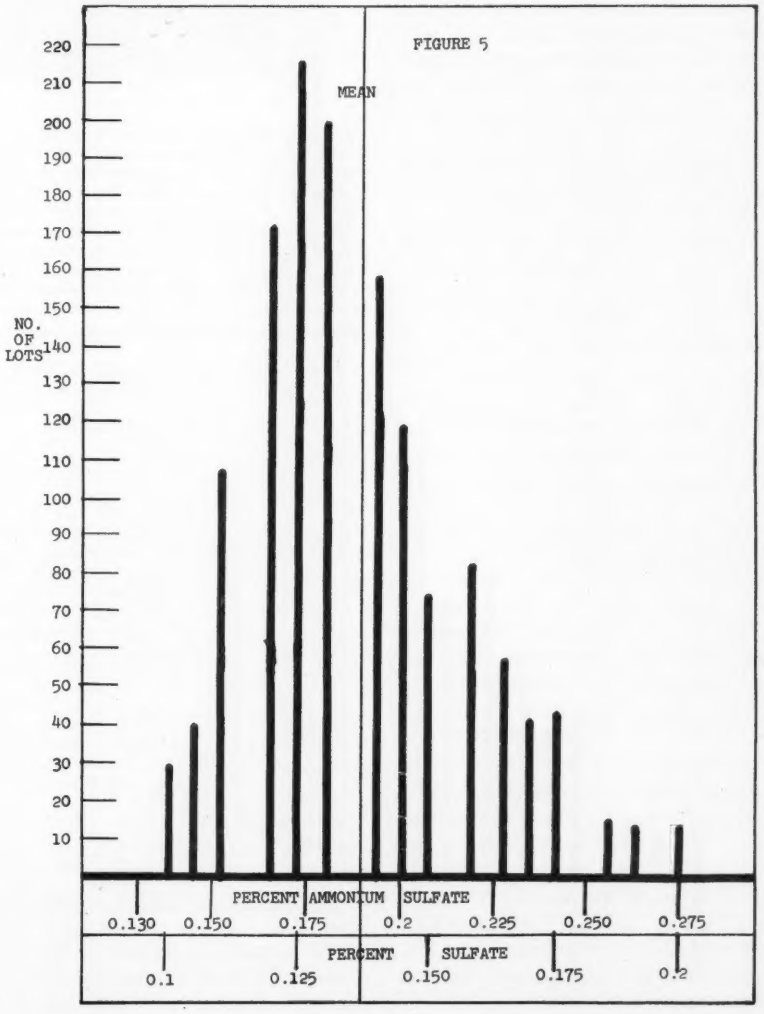
★ ★ ★

Figure 5 shows a bar chart of the actual ammonium sulfate content of Formvar 15/95E based on 1393 randomly chosen lots of Formvar produced during 1955. The average sulfate value of all 1393 lots was 0.138 per cent. This is significant since in enamel plants, batches of Formvar-phenolic enamel are usually prepared by blending several lots of Formvar to insure better enamel viscosity control. This blending also blends the trace salts so that the salt content of the resin as used probably approaches the average ammonium sulfate content shown in figure 5. Only 18 lots or 1.3 per cent of the Formvar lots shown in figure 5 reached the maximum specification and even if a Formvar lot with maximum ammonium sulfate were used it would still give magnet wire passing the NEMA specifications for dielectric strength (whether wet or dry) as shown by figures 1 and 2.

★ ★ ★

The average salt content of Formvar is very low. Nevertheless, the effect of a practically salt-free Formvar on dielectric strength was also investigated. The same Formvar used in these experiments was

(*Please turn to page* 1267)



Spiral Wrapping Machines and Materials

by Harold A. Myers
President and General Manager
Rinkle Krinkle Paper Company
Boston, Massachusetts

Nearly all wire mills, aluminum and copper plants throughout the country spiral wrap some portion of their production. This is being done for two purposes. The first and most important is for protection during transit and while storing. The second is for merchandising.

★ ★ ★

Spiral wrapping machines first came into use about fifty years ago for the wrapping of automobile tires in bundles of four and six tires. The rubber manufacturers enjoyed a lower freight classification if the tires were protected during shipment. From this came the wrapping of individual tires and thirty years ago, all tires shipped were wrapped individually or in bundles. A sixty pound flat kraft paper was used and glue was applied to the edge during the wrapping process. Today about the only tires being wrapped are the white sidewall tires and the premium brands, this mostly for merchandising. Bulk movements from the plants to branch plants and service stations are all by motor fleets and turn-overs are so rapid, there is no rubber deterioration as there is little storage time.

★ ★ ★

The first installations in the wire field made by Terkelsen was for the wrapping of insulated wire. Five hundred feet of wire wound on an 8″ block was paper wrapped on a small high production machine. Also five coils were wrapped in a single bundle on a larger machine. This spread through the trade and it became more or less standard to wrap all of the small coils. Today most of these small standard coils are shipped in suitable standard cartons without spiral wrapping.

Harold A. Myers

A paper prepared for presentation at the Annual Convention of the Wire Association in Pittsburgh, Pa., on October 31, 1956. Mr. Myers has been identified with the wire industry for many years, both through the manufacture of wrapping papers and the machines for applying them. Mr. Myers is also Vice President of the Terkelsen Machine Co., producers of the wrapping equipment.

The larger and heavier coils of insulated wires are now being wrapped by larger machines. The machine feed rolls are at floor level, so that coils are rolled into machines without any lifting whatsoever. They are wrapped and rolled through the machines for shipping and storage. It is fast, a single operator producing about seventy wrapped coils per hour. With the proper selection of wrapping materials, a sturdy economical package is produced that will withstand the ravages of transportation.

★ ★ ★

The steel mills and steel wire mills followed closely and the first real large scale wrapping was the 8″ coils of tire wire. It seemed at that time about every wire mill in the country was producing this same coil and in competition to the same customers. The operator would stand at a small 3-C machine, take the small unwrapped coils from one barrel, wrap them spirally and throw them back into another paper lined barrel for shipping. The wrapping production was high, many operators wrapping as high as two hundred wrapped coils per hour. This production is now being shipped in continuous lengths on large reels without any wrapping except for a sheet around the periphery of the reel. And now Reynolds Metal and National Standard have even discarded the reel.

★ ★ ★

Steel wire being wrapped today is for the protection of the wire and the protection of the finish from the mill to the ultimate user. If a coil is wrapped properly, it will not rust while in transit, no matter how many temperature changes it encounters and regardless of changes in humidity. You can spirally wrap an oil-slushed coil and months later, the original oil is intact under a waterproof tightly sealed spiral wrap. A bright finished wire coil will be just as bright when it reaches the customer, if it is properly wrapped. Many mills use a blue colored paper on bright wire. It seems to make bright wire look brighter.

★ ★ ★

Many different colored papers are now being used in product wrapping for product designation. One large mill uses orange colored paper on coils that are not continuous lengths. Several mills use a blue paper for wrapping needle wire coils. Copper wire plants use colors on insulated aluminum wire coils to differentiate them from copper coils.

★ ★ ★

(*Please turn to page* 1279)

Copper and Copper-Alloy Wire For Mechanical Purposes

by Theodore E. Veltfort, Manager
Copper and Brass Research Association
New York, New York

Distinction Between Electrical Wire and Mechanical Wire

It might be advisable at the start of this discussion to say a few words on the difference between electrical wire and mechanical wire as these terms are here used. The terms themselves largely indicate the prime purposes of the respective products, but these purposes differ so much in the product characteristics which they require that some further explanation appears warranted.

★ ★ ★

For electrical wire, current carrying capacity is, of course, the prime characteristic and conducting electricity practically the sole function, so that quite generally this product is made of pure copper and manufactured in its various forms primarily in accordance with the requirements necessary for efficient electrical functioning. It is produced in a fairly specialized industry, known broadly as the Wire Mill Industry and significantly this industry organization-wise is included among the electrical manufacturing industries in the National Electrical Manufacturers Association.

★ ★ ★

Mechanical wire, on the other hand, has a very broad field of application and is used for numerous purposes not limited to purely mechanical functions, as for instance where it is used for ultimately ornamental purposes. Sometimes electrical conduction is an important function of such wire, but there are many other requirements of equal or greater importance. It is one of the products produced by the brass mills, which also produce other basic wrought forms of copper and its alloys, such as sheet, plate, strip, rod, tube, pipe and shapes, some of which enter into the same applications as the wire.

Theodore E. Veltfort

A paper prepared for presentation at the Annual Convention of The Wire Association in Pittsburgh, Pa., on October 31, 1956. **Mr. Veltfort graduated from New York University with B.S. and C.E. degrees. From 1911 to 1938 he was with Stone & Webster Engineering Corp., working on engineering, construction and business analysis projects. In 1933 he assisted in the establishment of a trade association in the brass industry of which he was an executive and, when it was merged with the Copper & Brass Research Association in 1940, he became Manager.**

He is a past president of the American Trade Association Executives (now American Society of Association Executives); past president of Trade Association Executives in N.Y.C.; past chairman of the Advisory Council on Federal Reports; past chairman of the Manufacturing Trade Group of the National Industrial Council; President of Northeastern Institute; member of the Business Research Advisory Council of the Bureau of Labor Statistics; on Board of Directors of the Society of Business Advisory Professions; and is active in the American Standards Association (at present Vice-Chairman of the Standards Council) and other organizations in trade association and related fields. During World War II he organized and was a director of the Copper Recovery Corporation and in the recent Korean emergency, Chairman of the Non-Ferrous Scrap Metals Mobilization Council.

★ ★ ★

It is obvious that there is some overlap in these two broad classes of product and there may be certain border-line cases. But the differentiation is important because the industries that produce them are quite separate and distinct. Where a few types of mechanical wire can conveniently be made in the electrical wire mill it is included in that industry, but it is only in limited quantities and the great preponderance of mechanical wire is made in the brass mills.

★ ★ ★

It might be well to explain that the expression "Copper and Copper-Alloy" covers all metals in which copper content is at least 40%, and in which copper is the principal element. The metal is an alloy if not more than 99.2% is copper.

Quantity of Copper and Copper-Alloy Wire for Mechanical Purposes

In order to provide some idea of the volume in which the product we are discussing is used, it might be interesting to note that the average annual shipment of such wire from the brass mills during the last nine years, that is essentially the post-war years, was about 100,000,000 pounds and constituted about 5% of the total shipments of brass mill products. So far as the composition of the wire is concerned, about 5% was copper, 3% was nickel silver, phosphor bronze was about 6%, and the balance of 86% was made up largely of standard brasses and some special alloys. This output of mechanical wire compares with

an annual output of approximately one and a half billion pounds of electrical wire and cable. The fact that the production of mechanical wire compared with brass mill production in general and with the output of electrical wire and cable, is relatively small pin-points the fact that because it goes into a myriad of uses, it has to be available in a great variety of characteristics, and is one of those functional items, which while perhaps small in relation to the article into which it enters, nevertheless is vital to the proper functioning of that article.

Uses

The applications of mechanical wire are so very extensive that it is impossible to catalog the individual uses. Broad classifications of use, however, are significant. It is extensively used for fasteners of all sorts, running the entire gamut from screws, nails, bolts, studs and rivets to pins, clasps, and clips, through to hooks and eyes and slide fasteners. It is used quite widely for springs of all kinds. An important application consists of electrical contacts and terminals. Other important applications are in medical, surgical and dental equipment, jewelry, dress accessories and fishing tackle. Mechanical wire has important applications in hardware. It is important in marine equipment and supplies, in communication appliances and devices, in electronic equipment and in defense components. It is woven into a large variety of screens for various applications from window screens to fourdrinier screen cloth. These applications, of course, straddle practically all fields of industry, and it is quite apparent why the product has to be made available in a wide range of characteristics.

Alloys, Tempers, and Shapes

The Copper & Brass Research Association Manual of Standards lists forty standard commercial wrought copper and copper-base alloys. Mechanical wire is commonly available in the following of these alloys:

Electrolytic Tough Pitch Copper
Oxygen-Free Copper
Gilding, 95%
Commercial Bronze, 90%
Jewelry Bronze, 87.5%
Red Brass, 85%
Low Brass, 80%
Cartridge Brass, 70%
Yellow Brass
Medium-Leaded Brass
Phosphor Bronze, 5% (A)
Phosphor Bronze, 8% (C)
Phosphor Bronze, 10% (D)
Phosphor Bronze, 1.25% (E)
Nickel Silver, 65-18
Nickel Silver, 55-18
Nickel Silver, 65-10
High-Silicon Bronze (A)
Low-Silicon Bronze, (B)

★ ★ ★

Wire of these alloys is available in a large number of standard annealed and standard drawn tempers, the number of tempers available varying, of course, with the alloy. Quite commonly one or more of the range of tempers from annealed through hard to spring tempers are available.

★ ★ ★

It is impracticable in a paper of this kind to present the properties of these various alloys as they apply to wire, but the Copper & Brass Research Association Manual of Standards, a copy of which is available to any of you who have an interest in this matter, sets forth in detail for each alloy, the composition, the nearest applicable to ASTM specifications, physical properties, typical uses, common fabrication processes for which the alloy is used, fabrication properties which affect its use, forms and tempers most commonly used, and the mechanical properties.

★ ★ ★

Besides the alloys mentioned above, wire is also made in a number of special alloys designed to meet particular requirements. An important alloy of this kind is beryllium copper, whose outstanding characteristics are strength, toughness, resiliency to flexure, high resistance to corrosion, and heat treating and precipitation hardening properties.

★ ★ ★

Mechanical wire is available not only in regular cross sections, such as round, half round and square, but also flat with round or square edges, and special shapes; it is available in coils, spools and in random or exact lengths.

General Properties

The copper and copper-base alloys have some outstanding properties which make mechanical wire of such metals so widely adaptable to a great range of uses. The alloys in general possess ductility, good strength, resistance to corrosion and good workability. They are readily joined by one or more of the common means, such as soldering, brazing and welding. Various of these properties are accented in certain of the alloys where the use makes these particularly important. The requirements of a large field of use is met by the more common alloys such as the copper-zinc brasses and commercial bronze. Where great strength, endurance and corrosion resistance and conductivity are all required the phosphor bronzes are available, and where light color is needed in combination with the other favorable characteristics of copper-base alloys, the various nickel silvers serve admirably. Where unusual strength and toughness with a high resistance to corrosion are wanted and where electrical conductivity is not so essential the silicon bronzes should be considered.

★ ★ ★

Tensile strength varies over a wide range depending on the temper. For Cartridge Brass, 70%, for instance, the tensiles are as follows:

Annealed	**0.050mm**	**48,000 psi**
	0.035mm	**50,000 psi**
	0.025mm	**52,000 psi**
	0.015mm	**54,000 psi**
⅛ Hard		**58,000 psi**
¼ Hard		**70,000 psi**
Extra Hard		**124,000 psi**
Spring		**130,000 psi**

Elongation varies from 64% in 2 inches for the annealed temper to 3% for the Spring temper

For Phosphor Bronze, 5% (A):

Annealed	**0.035mm**	**50,000 psi**
¼ Hard		**68,000 psi**
½ Hard		**85,000 psi**
Hard		**110,000 psi**
Extra Hard		**130,000 psi**
Spring		**140,000 psi**

Elongation varies from 58% in 2 inches for the annealed temper to 2% for the spring temper. Endurance strength for the extra hard temper is 30,000 psi (100 million cycles).

★ ★ ★

One of the important and extraordinary properties of the copper and copper alloys is color. This

(*Please turn to page* 1234)

Plasticizers for the Wire and Cable Industry

by William C. Goodwine
Sales Manager, Plasticizers
Tennessee Products & Chemical Corporation
Chemical Paint & Metallurgical Division of
Merritt-Chapman and Scott
New York, New York

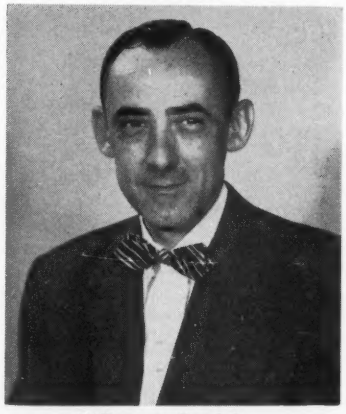
Throughout the plastics industry, even a cursory inquiry develops the thought that the ideal plastic would be one requiring no plasticizer or other additive type material. Stemming from this generalization is the secondary theme that, since most plastics do require some plasticizer, then the ideal would be a single plasticizer compound that would satisfy all demands of efficiency, low temperature flex, heat stability, permanence etcetera—all at low cost.

★ ★ ★

Considering just one part of the plastics industry, albeit a large segment, a review of the vinyl insulation field opens the way to much diverse opinion as to what constitutes the best or all-around plasticizer for the field. Because of the complexity of application in both the communication and power cable fields, the demands for very low temperature flexibility on the one hand and high heat resistance on the other, the insistence on good electrical properties for most applications and the apparent disregard of such properties in other end uses, one tends to get a very confused picture of the overall needs of the wire and cable industry.

★ ★ ★

During recent years, particularly spurred by the demands of World War II, polyvinyl chloride compounds have won a very large place in the insulation field . . . particularly in building, appliance and automotive wiring. To have at least an order of magnitude of the quantity of products being considered, let us look at a few statistics. In 1953, the wire and cable industry, exclusive of other extrusion end uses, is reported to have used 58 million pounds of polyvinyl chloride resin and close to 37 million pounds of plasticizer. By 1955, estimates of consumption range slightly in excess of 80 million pounds of resin with a calculated increase in plasticizer consumption to about 50 million pounds. Interestingly enough, only about twelve firms make up the list of largest users and account for almost 50% of this total consumption. Similarly, of this total resin poundage, almost one-third (about 30%) represented the supply of electrical grade, pre-plasticized compound, proof that a large number of individual wire firms still prefer to buy compound rather than perform their own blending operation. Beyond this "big dozen" large consumer list, are the many smaller firms, specialists in many cases, who constitute the balance of the industry. In round numbers, it is estimated that there are now one hundred firms extruding polyvinyl chloride insulation.



William C. Goodwine

A paper prepared for presentation at the Annual Convention of The Wire Association in Pittsburgh on October 31, 1956. The author holds a degree of B.S. in Chemistry from Fordham University. He has served as a chemist for the Nassau Smelting & Refining Co., as an analytical chemist for duPont at their Grasselli Plant, as chemist for the J. T. Baker Chemical Co. and then joined Celanese Corporation of America in 1947 as a salesman in the Organic Phosphates Dept., and in 1952 was made Sales Manager, Plasticizers. He left Celanese in February of this year to work for Tennessee. Mr. Goodwine spent four years in the Armed Forces and was separated in 1946 with the rank of Major.

★ ★ ★

Thus, from the viewpoint of plasticizers alone, we are considering a large and dynamic market.

★ ★ ★

A breakdown of this sales volume, recently accounted for plasticizers in the wire and cable field as follows:

Phthalates	**62%**
Phosphates	**15%**
Polymerics	**9%**
Low Temperature Types	**8%**
Miscellaneous, including Extenders	**6%**

★ ★ ★

The market area in turn was identified as centered in the New England and Greater Metropolitan New York areas with the Mid-West, Middle Atlantic, West, South and Southwest following in importance in the order named. Of the total volume, close to 70% is concentrated in the North Eastern areas—and, at least one authority, has noted that better than 65% is concentrated in the building wire application.

★ ★ ★

Within the two most important plasticizer classifications, we find the time honored stand-bys, dioctyl phthalate and tricresyl phosphate still maintaining their pre-eminent position, as late as 1955. DOP—the di-2 ethyl hexyl phthalate—is still the most widely used, largest single volume plasticizer

for wire and cable application, as well as for the many other uses in the vinyl industry. DIOP, di-iso octyl phthlate, based on oxo process alcohols, has successfully challenged DOP and is regarded by some using firms as the equal to DOP and used interchangeably with it. More recently, the decyl phthalates have made a strong bid for acceptance and have gained a fairly large share of the market since their lower volatility, permanence and electrical characteristics have proved generally more favorable than both DOP and TCP while cost on a pound basis is the same or lower. For 80°C wire (and even in some higher temperature wire formulations) the decyl phthalate appears to be acceptable and a welcome addition to the field. Yet, upon analysis, DOP still leads the phthalate group in sales to the wire industry.

★ ★ ★

We have a somewhat similar situation in the second classification, where to all intents, tricresyl phosphate accounts for practically all of the phosphates used, at least until 1955. As a companion to DOP, tricresyl phosphate has enjoyed a favored position in the vinyl insulation field since its inception. Maintaining a price advantage over DOP for many years, tricresyl phosphate contributed low volatility, permanence, high solvating characteristics and flame resistance as well. About three years ago, the price structure changed and in the succeeding years, the price spread between these two products widened such that DOP gained even more favor and the importance of tricresyl phosphate in wire insulation began to diminish. It is my opinion that tricresyl phosphate will continue, however, to maintain an important position in the field altho even further volume displacement can be expected to occur.

★ ★ ★

Of the several types of plasticizers mentioned, the polymeric classification seems to present the greatest growth potential—and is considered to be the most dynamic group of materials in the plasticizer field. As the demand for more permanence, and more heat resistance in insulation continues, it is expected that requirements will only be met by polymeric types, almost to the exclusion of the monomeric types. However, taking into consideration the low temperature flexibility shortcomings of the polymerics we can also look forward to a modest growth in the latter classification. Thus we have a generalized picture of the market for plasticizers in the wire and cable industry.

★ ★ ★

Of more immediate concern, however, are these two questions:

The first we might ask of the plasticizer industry. In view of the large market for plasticizers in the vinyl insulation field, what is being done to satisfy the peculiar demands of this industry, particularly in the development of special products and specifications applicable to wire insulation usage?

The second, we can turn to the Wire Industry itself. Just what do you require of a plasticizer and what constitutes a basic meaningful specification?

★ ★ ★

As you can well imagine, there are a multiplicity of answers to both of these questions. But as late as 1953, in a review of the published specifications of the plasticizer industry, one could not find a single electrical specification listed.

★ ★ ★

Much important data was revealed, however, under such headings as "typical properties" or "test data" including power factor, dielectric constant, and direct current resistivity. There existed then and still exists the lack of a broad acceptance of standardization on electrical specifications. This, despite the fact that many plasticizer manufacturers do offer "electrical grades" of many plasticizers. From this we can infer at least a cognizance of the problems of the wire field. It is indeed a fact that much work has been done by the plasticizer industry alone and in close cooperation with resin producers and insulation manufacturers. The industry wants to satisfy the wire companies' needs but evidently the goal has not yet been achieved.

★ ★ ★

The need appears to be the basic necessity for defining first, just what points should constitute a specification and second, the determination of quick, inexpensive, accurate and useful test procedures.

★ ★ ★

This simple statement involves many problems.

★ ★ ★

About the quickest method available is the use of the cell test on the liquid plasticizer. Unfortunately, the correlation of liquid cell test results with volume resistivity of a plasticized slab or insulation resistance of finished wire has proven almost impossible. Such test procedure is used by some firms however, as an "order of magnitude" control for electricals to be followed by a volume resistivity test or actual determination of insulation resistance.

★ ★ ★

Two major contributions are, in my opinion, reflected in the reported work of Balmer and Conyne of the Rohm & Haas Company in their definition of a satisfactory test procedure for determination of volume resistivity of a plasticized slab—results of which are closely correlated with insulation resistance values. The second constitutes a break with tradition and involves the inclusion of volume resistivity as a specification by Celanese Corporation for their electrical grade of tricresyl phosphate.

★ ★ ★

From these two bases, we have at least a partial answer—but it constitutes only a beginning since the particular slab formulations differ as to constituents:

The Rohm & Haas Recipe (1)		
Geon 101	**65**	**parts**
Plasticizer	**35**	
Tribase	**5**	
#33 Clay	**15**	
Aristowax	**0.3**	

The Celanese Recipe (2)		
Geon 101 EP	**60**	**parts**
Plasticizer	**40**	
Dyphos	**7**	
DS 207	**0.15**	

★ ★ ★

Such differences in evaluation formulations are quite common . . . with variations existing with prac-

(*Please turn to page* 1247)

Silicone Insulated Conductors

by Donald F. Christensen
Electrical Section
Product Engineering Laboratories
Dow Corning Corporation
Midland, Michigan

Introduction

Despite the fact that they must compete with lower cost materials, silicone dielectrics are rapidly increasing in popularity for a variety of domestic and military wire and cable applications. Reasons for the acceptance of silicones as insulating materials for electrical conductors include, of course, exceptional resistance to high temperatures. In some applications, however, the resistance of silicones to corona, fungus and flame or fire are equally as important.

★ ★ ★

Eight different types of silicone insulated wire and cable are currently available. These are: 1) fibrous insulated magnet wire, 2) enameled magnet wire, 3) aircraft wire, 4) shipboard wire and cable, 5) appliance and fixture wire, 6) apparatus lead wire, 7) electronic hook-up wire and 8) defroster wire.

Fibrous Insulated Magnet Wire

Silicone conductor insulation had its beginning with the development of glass-served magnet wire. In this construction copper wire is wrapped with one or more layers of glass fibers. Silicone or modified silicone resins are used to bond the fibers to the conductor. This resin-impregnated serving gives the wire excellent electrical and mechanical properties.

★ ★ ★

Considerable test data and field experience have been collected since Dow Corning developed the first practical Class H bonding resin for glass-served wire in 1945. Now, glass-served silicone bonded wire together with other silicone insulating components is used to produce an insulation system of unequaled thermal stability—Class H insulation.

Donald F. Christensen

This paper was prepared for presentation at the Annual Convention of The Wire Association in Pittsburgh, Pa., on October 30, 1956.

The author joined Dow Corning in June, 1951, in the Product Engineering Department, where he has been occupied in developing and evaluating silicone materials for the electrical and electronic industries. He participated in the development of Dow Corning 2007 as a silicone rubber encapsulating paste product. He is at present responsible for the direction of tests to evaluate dielectric materials. He is a graduate of the University of Michigan, from which he holds a degree of B.S. in Electrical Engineering. Prior to this he had served in the U. S. Air Force.

★ ★ ★

To prove the reliability of this system, we have tested over 100 silicone insulated motors in our motor test laboratory. Two of these test motors have now been operated more than 55,000 hours at an average copper temperature of 240 C. The data obtained in our test program suggest that an all silicone (Class H) system, including glass-served silicone bonded wire, might be rated for operation at 220 C or higher. This same Class H system has recently been approved by AIEE for use in transformers at a hottest spot temperature of 220 C. There are many indications that silicone insulation may be useful at much higher temperatures. For example, a conventional induction motor insulated with silicone dielectrics and wound with silicone resin-bonded, glass-served wire has operated for 200 hours at an average copper temperature of 400 C. Ordinary organic electrical insulating components fail quickly at this temperature. We believe proper equipment design plus silicone insulation will eventually produce equipment with satisfactory life at very high temperatures.

★ ★ ★

Recently, The **Phelps Dodge Copper Products Company** introduced "Daglas," a new type of fibrous insulated wire. "Daglas" is a combination of glass and polyethylene terephthalate fibers bonded with a modified silicone resin. This combination of fibers enables the wire to withstand severe mechanical abuse. The bond between the serving and the conductor is excellent and the organic fibers do not compromise the thermal stability of the combination. Laboratory testing of AIEE motorettes[1] wound with "Daglas" indicates this wire insulation will qualify for use at recognized Class H temperatures. Results of the motorette test program are shown in Table I in which glass-served and "Daglas" magnet wire are compared in identical systems on the basis of the thermal life of the motorette.

Enameled Magnet Wire

Dow Corning "Sylkyd" wire enamel was introduced to the

TABLE I

LIFE OF SILICONE INSULATING SYSTEMS

AIEE Motorette	Life, Hours 300 C	275 C	250C
Glass-Served Silicone-Bonded	1 failed after 48 hrs.	1 failed after 840 hrs.	1 failed after 5784 hrs.
	7 failed after 192 hrs.	1 failed after 1680 hrs.	1 failed after 9144 hrs.
	1 failed after 240 hrs.	1 failed after 4082 hrs.	2 failed after 10,488 hrs.
	1 failed after 336 hrs.	1 failed after 4946 hrs.	6 still oper. after 25,272 hrs.
		1 failed after 5114 hrs.	
		1 failed after 5618 hrs.	
		1 failed after 6122 hrs.	
		3 failed after 6982 hrs.	
Daglas, Silicone-Bonded	1 failed after 148 hrs.	1 failed after 1218 hrs.	1 failed after 3542 hrs.
	1 failed after 484 hrs.	1 failed after 1890 hrs.	1 failed after 5170 hrs.
	1 failed after 556 hrs.	8 still oper. after 5241 hrs.	8 still oper. after 7858 hrs.
	7 still oper. after 1592 hrs.		

electrical industry about three years ago. This was an important development since high temperature wire enamels were nonexistent before 1953. Enameled magnet wire has the advantage of a better space factor plus improved mechanical properties over a fiber-insulated conductor.

★ ★ ★

High thermal stability in an enameled wire was first realized with Sylkyd enamel. Extensive wire twist and motorette test programs have shown that this wire insulation may qualify for operation at temperatures in the range of 180 C. Dow Corning life tests of motors wound with Sylkyd enameled wire are shown in Figure 1. On this graph the life of three motor insulation systems is compared. These are: 1) a Class A system, 2) a silicone system using Sylkyd enameled wire and 3) a silicone system using silicone resin-bonded, glass-served wire. The motor test data for Sylkyd enameled wire suggest it is satisfactory for use at a hottest spot temperature of 180 C.

Aircraft Wire

Reliability is an essential requirement of aircraft wire and cable insulation. During emergency conditions, parts of the cable may be subjected to fire, yet the electrical system must continue to function. Some silicone rubbers possess properties ideal for aircraft wire and cable applications[2]. Silicone rubber-insulated wire designed to meet the requirements of MIL-W-8777 is an example.

★ ★ ★

An interesting comparison of the flame resisting properties of silicone rubber and PVC-insulated wires can be obtained by recording changes in insulation resistance of the wire during flame exposure. Figure 2 contains data compiled in tests with MIL-W-8777 silicone rubber-insulated wire and MIL-W-5086 PVC-insulated wire using the flammability sample as described in MIL-W-8777. In the test, the d.c. leakage current in microamperes is measured with different voltages applied while the samples are exposed to the flame. From these measurements, insulation resistance can be calculated.

★ ★ ★

A minimum insulation resistance of about 20 megohms was measured on the silicone rubber cable with 500 volts d.c. applied. As the wire continued to decompose

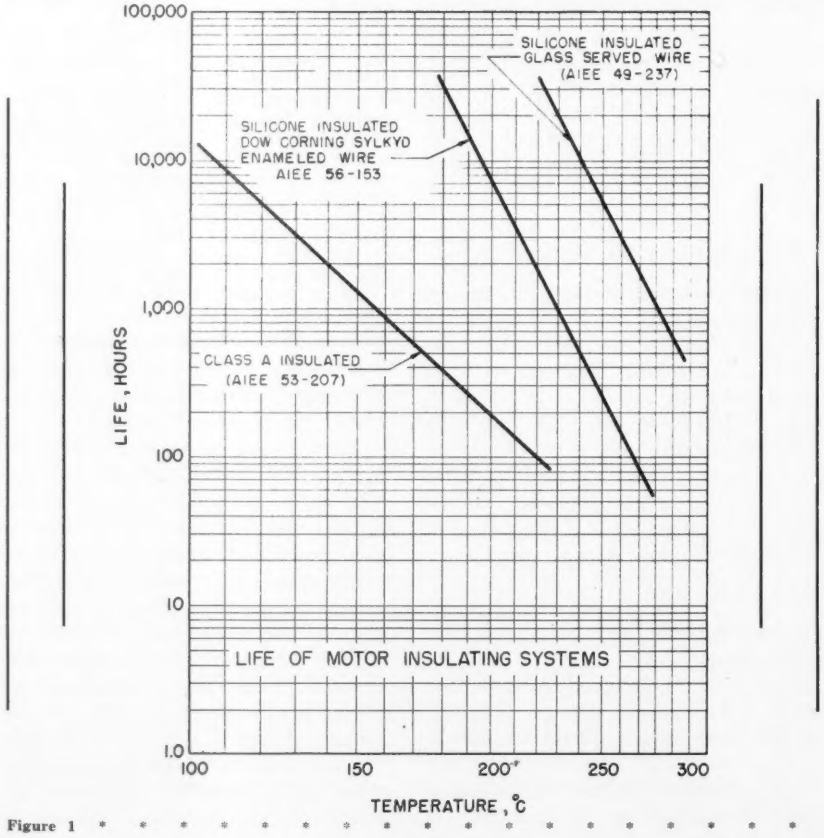


Figure 1

in the flame, the insulation resistance gradually increased. After 30 minutes in the flame the dielectric strength was still 2300 volts. When 500 volts d.c. were applied to the PVC insulated wire, insulation resistance dropped to approximately 10,000 ohms in less than one minute. After two minutes in the flame, complete dielectric failure occurred. The tests on the PVC wire were repeated with 110 volts d.c., but again breakdown occurred after 5 minutes.

★ ★ ★

These tests indicate that if the silicone rubber insulation is given sufficient mechanical support or if the outer braid remains intact, the cable will remain serviceable at full line voltages. This is the utmost in reliability.

Shipboard Power and Control Cable

Silicone rubber tape and extruded walls of silicone rubber are used for primary insulation on shipboard power and control cables.

★ ★ ★

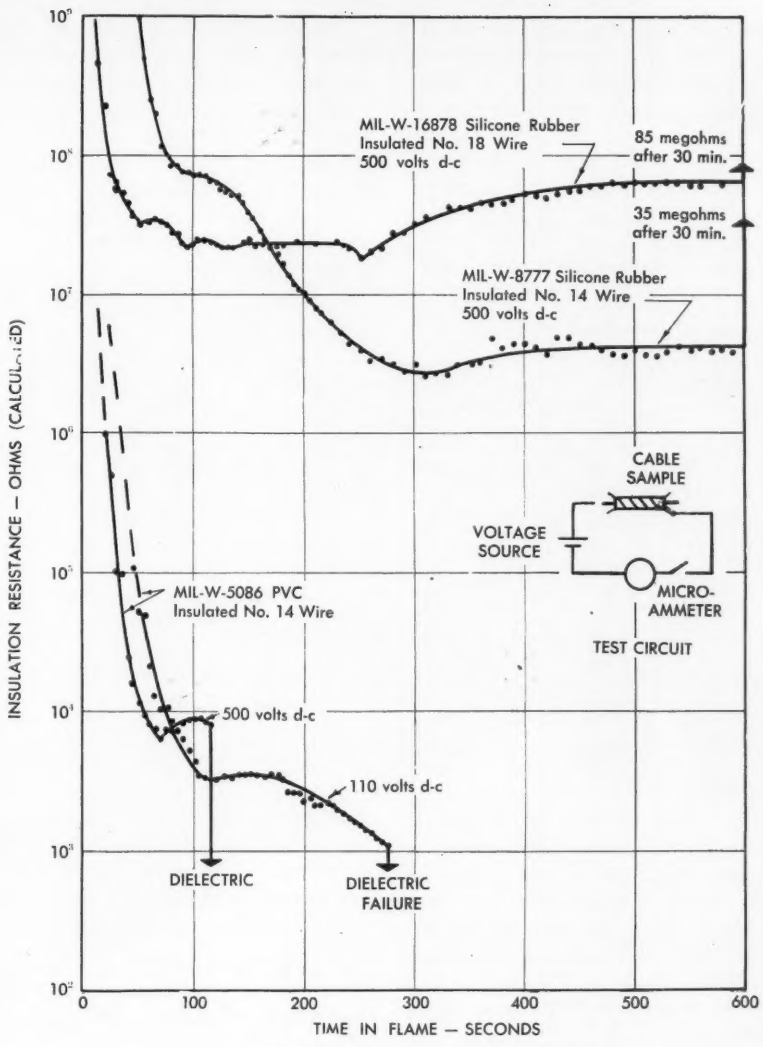
Cables made in accordance with MIL-16878A are insulated with an extruded wall of silicone rubber. Designed to have minimum size and weight, these wires and cables are used for shipboard wiring of meters, panels and electronic equipment. Silicone rubber insulated wires for this application are rated up to 1000 volts, rms, with a maximum operating temperature of 200 C.

★ ★ ★

Reduced diameter power and control cables for shipboard use are being manufactured to meet the requirements of MIL-C-2194B. Both single and multiple conductor cables are available with the emphasis placed upon minimum diameter and weight and flame resistance. In sizes smaller than No. 10 AWG, the primary insulation is an extruded wall of silicone rubber. In sizes larger than No. 10 AWG, power cables are insulated with fully cured, silicone rubber coated glass cloth tape.

★ ★ ★

Recent laboratory work indicates the construction of power cable may be improved by using a semi-vulcanized silicone rubber tape. On application of heat and pressure, this tape vulcanizes to form a homogeneous insulating jacket. Bonding eliminates the chance dielectric failure caused by poor register in the overlay of the tapes.


INSULATION RESISTANCE — OHMS (CALCULATED)
TIME IN FLAME — SECONDS
MIL-W-16878 Silicone Rubber Insulated No. 18 Wire 500 volts d-c
85 megohms after 30 min.
35 megohms after 30 min.
MIL-W-8777 Silicone Rubber Insulated No. 14 Wire 500 volts d-c
MIL-W-5086 PVC Insulated No. 14 Wire
500 volts d-c
110 volts d-c
DIELECTRIC
DIELECTRIC FAILURE
CABLE SAMPLE
VOLTAGE SOURCE
MICRO-AMMETER
TEST CIRCUIT

FLAME RESISTANCE OF SILICONE RUBBER AND PVC INSULATED WIRE

Figure 2

★ ★ ★

The advantages of silicone rubber for Navy applications have been reported in an earlier paper[3]. It should be pointed out that these same advantages also apply to other applications. It is worth repeating, that through the use of silicones, these cables incorporated a 30 per cent reduction in space as well as a 20 per cent reduction in weight as compared to previous cable designs.

★ ★ ★

Silicone rubber insulated ignition wire designed to meet MIL-C-3162 is also available. This wire was developed for use on Army ordnance vehicles.

Appliance and Fixture Wire

Silicone insulation for electrical conductors is a logical choice for military applications. However, the domestic market is rapidly realizing the advantages of silicone conductor insulations. For example appliance and fixture wires in many sizes are now available with either a silicone rubber or silicone resin impregnated fiber construction.

Felted asbestos, glass braided appliance wire impregnated with a silicone resin is used in small appliances and electric ranges. This heat resistant wire is virtually fire-proof and smoke-proof. What's more it offers moisture resistance and does not fray after many hours service at temperatures as high as 550 F.

★ ★ ★

Silicone rubber insulated wire is now used on electric frying pans, ranges and clothes driers for lead and thermocouple connections. Other applications include wiring for heating devices and high wattage lighting fixtures.

★ ★ ★

Silicone rubber insulated fixture wire is also used for outdoor as well as indoor applications. As an example, a large chemical company uses this wire in their explosion-proof lighting systems. More than 50,000 fixtures using over 200,000 feet of wire have been installed. The wire is used to connect the fixtures to junction boxes. This system functions 24 hours a day and is subjected to outdoor weathering plus unusually high chemical contamination. Temperatures are high because the fixtures are completely sealed. Maintenance, usually a problem in this system, has virtually been eliminated.

Apparatus Lead Wire

Silicone rubber insulated lead wire is available for high temperature apparatus applications. Much of this wire is similar in construction to wire manufactured to meet the requirements of MIL-W-16878A. Silicone rubber insulated apparatus wire is also recommended for use as lead wire in Class B electrical equipment. It has excellent resistance to high temperature, moisture and ozone.

Electronic Hook-Up Wire

Silicone rubber possesses many properties desirable for electronic hook-up wire. Among these are flame, moisture and fungus resistance. Also, silicone rubber insulated hook-up wire can be soldered with no danger of lifting or shrinking of the insulation.

Pin holes in wall thicknesses less than 20 mils is a problem with currently available silicone rubber insulated hook-up wire. Elimination of this difficulty will increase the demand for this high temperature wire insulation.

Defroster Wire

Resistance wire insulated with silicone rubber is finding application in heating devices. Defroster harness wire for refrigerators is available in a range of sizes with and without an outer braid. Approved for continuous operation at 150 C, these wires are rated for 300 V service. Silicone rubber insulated wire offers fast and easy installation. Its flexibility allows easy formation around complicated shapes. A typical application is illustrated in Figure 3.

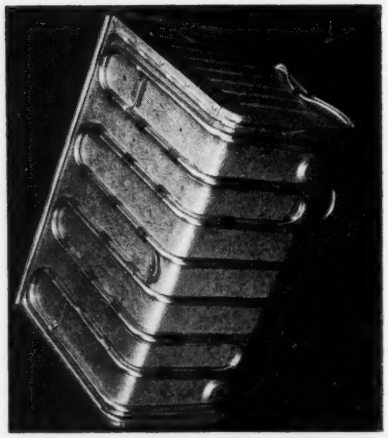


Figure 3

New Developments

Coaxial cable, insulated with silicone rubber for either high or low temperature service, has been produced on a laboratory scale. The conductor of this RF cable is supported by a web configuration of silicone rubber. A silicone rubber sheath is used over the copper braid. Standard values of characteristic impedance and capacitance are obtained with this construction.

★ ★ ★

Figure 4 compares the attenuation factor of the silicone rubber coaxial cable with that of a polyethylene cable of similar dimensions. The attenuation factor of both cables is comparable up to 1000 Mc.

(*Please turn to page* 1251)

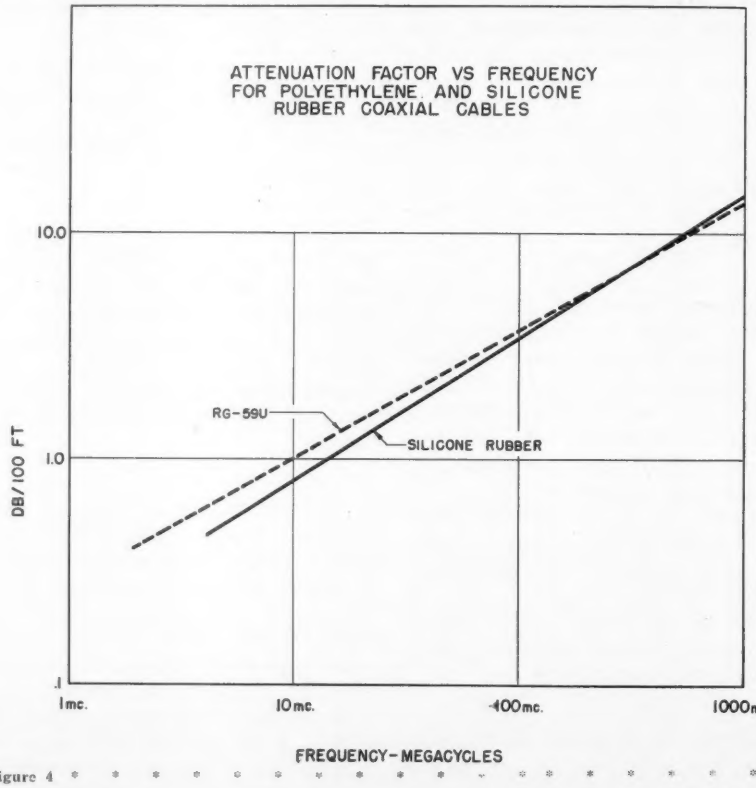
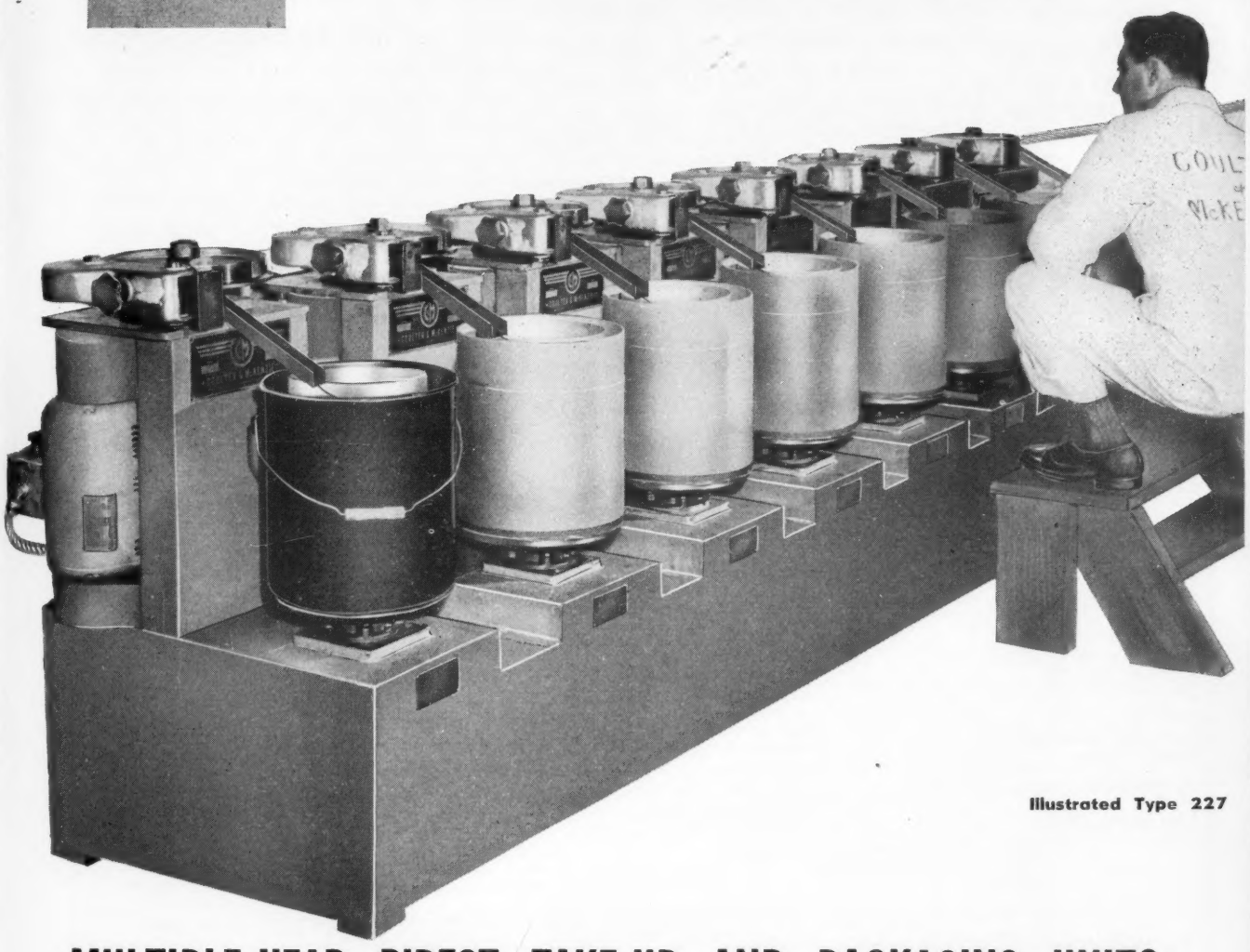


Figure 4

DRAW • PAK TAKE-UP UNITS



Illustrated Type 227

MULTIPLE-HEAD DIRECT TAKE-UP AND PACKAGING UNITS

Direct take-up to convenient process or shipping containers.

With the Coulter & McKenzie DRAW-PAK method you will realize longer continuous runs, larger container capacity, and better quality with far less handling.

Individual or common motor drives for galvanizing, annealing, enameling and tinning of most materials from fine soft copper to coarse high-carbon wire.

Arrangement, number of heads, and motor drives to meet your individual container, process and floor space requirements.

Kindly supply ALL process information when inquiring about DRAW-PAK equipment.

Coulter & McKenzie also makes a complete line of dereeling devices. Write for complete "D-PAKER" catalog.

Model	Std. Bare Wire Pkg. Wt.	Standard Package OD X HT X Construction	Optional Bare Wire Package Weight
127	500	20" x 30" Fibre	250 to 750
227	100	11" x 12½" Fibre or Steel	50 to 150
327	40	8" x 9½" Fibre or Steel	10 to 40

Patent No. 2,732,060—other U. S. and foreign patents pending.

771 WATER STREET
OPPOSITE RAILROAD STATION

TELEPHONE EDISON 5-1101
LIEBER'S CODE "MACKENZIE"

THE COULTER & McKENZIE MACHINE CO., INC.

BRIDGEPORT 3 CONNECTICUT U S A

President
LESLIE C. WHITNEY
Mgr. Development Eng'g.
Copperweld Steel Company
Glassport, Pa.

Executive Secretary
RICHARD E. BROWN
453 Main Street
Stamford, Conn.

THE
WIRE ASSOCIATION
453 MAIN STREET
STAMFORD, CONN.

Official Publications
"Wire and Wire Products"
"Wire and Wire Products Buyers Guide and Year Book of the Association"

Vice President
TOM M. GIRDLER, JR.
Assistant Division Manager
Union Drawn Steel Div.
Republic Steel Corp.
Massillon, Ohio

Vice-President
RALPH B. ROTH
Vice-President and Sec'y
Ludlow Saylor Wire Cloth Co.
St. Louis, Mo.

BOARD OF DIRECTORS

R. E. BROWN, Publisher
WIRE AND WIRE PRODUCTS
Stamford, Conn.

FRED M. CRAPO, President
Indiana Steel & Wire Co.
Muncie, Ind.

L. C. CREWE, JR., President
Maryland Fine & Specialty Wire Co., Inc.
Cockeysville, Md.

ALLAN B. DOVE, Research Supervisor
Steel Company of Canada, Ltd.
Hamilton, Ont., Canada

JAMES E. FLOOD, Chem. Eng.
Plastic Wire & Cable Corp.
Jewett City, Conn.

TOM M. GIRDLER, JR., Asst. Mgr. Ops.
Union Drawn Steel Div.
Republic Steel Corp.
Massillon, Ohio

C. L. McGOWAN, Supt. Wire Mill
Atlantic Steel Corp.
Box 1714, Atlanta 1, Ga.

FRANK R. NICHOLS, President
Nichols Wire & Aluminum Co.
Davenport, Ia.

ROBERT C. PETERSON, Manager
Thompson Wire Co.
Worcester, Mass.

EARL R. POTTER, President
Industrial Wire Products Corp.,
Los Angeles, California

RALPH B. ROTH, Vice President and Sec'y.
Ludlow Saylor Wire Cloth Co.
St. Louis, Mo.

JOHN L. SANDERSON, Supt., Wire Mills
Keystone Steel & Wire Co.
Peoria, Ill.

BENOIT J. SIROIS, Met. Eng.
Phelps Dodge Copper Products Co.
Bayway Plant, Elizabeth, N. J.

S. R. SNOW, Asst. to V.P.
American Steel & Wire Div.
United States Steel Co.
Cleveland, Ohio

LESLIE C. WHITNEY, Mgr., Dev. Eng.
Copperweld Steel Co.
Glassport, Pa.

CHARLES H. WILLIAMS, JR., Supt.,
Rod and Wire Mills
Pittsburgh Steel Co.
Monessen, Pa.

GRAYSON B. WOOD, JR., Metallurgist
Scovill Manufacturing Co.
Waterbury, Conn.

RAYMOND S. WORTH, Mfg. Mgr.
John A. Roebling's Sons Corp.
Roebling, N. J.

PAST PRESIDENTS

JOHN MORDICA, Supt.
Rod & Wire Mills
Bethlehem Steel Co.
Sparrows Point, Md.

RALPH K. CLIFFORD, President
Continental Steel Corp.
Kokomo, Indiana

F. A. WESTPHAL, Division Mgr.
Sheffield Steel Corp.
Sand Springs, Okla.

J. K. BEESON, Vice-President Charge of Sales
Pittsburgh Steel Co.
Pittsburgh, Pa.

CARL E. JOHNSON, Superintendent
Rod & Wire Mills
Bethlehem Steel Co.
Sparrows Point, Md.

D. D. BUCHANAN, Manager of Operations
Union Drawn Steel Div.
Republic Steel Corp.
Massillon, Ohio

LEROY D. SEYMOUR, Mfg. Mgr.
Wire Mills Div.
John A. Roebling's Sons Co.
Roebling, New Jersey

FRED M. CRAPO, President
Indiana Steel & Wire Co.
Muncie, Indiana

JOHN A. MORITZ, Supt., Wire Mill
Keystone Steel & Wire Co.
Peoria, Ill.

R. M. HUSSEY, Asst. Manager Construction
Jones & Laughlin Steel Corp.
Pittsburgh, Pa.

L. C. CREWE, JR., President
Maryland Fine & Specialty Wire Co.
Cockeysville, Maryland

Titles and connections of Past Presidents are those at the time each held office.

The Wire Association is a non-profit organization of wire mill executives, superintendents and foremen. It also includes plant engineers, traffic men, and all others engaged in the production of cold drawn bars, rods, wire, strip, insulated wire and cable, and the manufacture and fabrication of finished wire products, including cold headed, extruded and other cold worked metal products.

There are separate divisions for all the various major interests in the wire industry, steel, iron, brass, copper, alloy, and precious metals, together with divisions relating to drawing, cold working, cold heading, extruding, fabricating, forming, spring making, wire cloth, wire rope, bare and covered electric wire and cable and all other forms of wire and wire products.

PURPOSES

Its specific purpose is to improve production methods and afford a clearing house for ideas on management problems, technical problems and research work in all phases of practical rod, bar and wire manufacture, electric wire and cable production and wire product fabrication, and to develop and maintain friendly relations among members.

ACTIVITIES

The Association functions along the following lines:

1. The use of the Association headquarters as a central clearing house for information and data of all kinds which may be of interest to members.
2. The exchange of ideas on processes of production including machinery, technical processes, etc.
3. The establishment and maintenance of friendly relations among the members of the association and the development of sectional and national meetings to discuss matters of mutual interest.
4. Studies of production methods and analysis of production costs.
5. Developments in the use of new materials and new applications of existing materials and by-products.
6. Research and collection of information on personnel management, including such factors as labor turnover, seasonal changes in the demand for employees, wage scales, etc.
7. Standardization and simplification as a means for the effective elimination of waste.
8. Such other subjects as may be determined upon.

THE ANNUAL CONVENTION OF THE WIRE ASSOCIATION

PENN-SHERATON HOTEL, PITTSBURGH, PA., MONDAY THROUGH THURSDAY, OCTOBER 29 - NOVEMBER 1, 1956

The Wire Association's Headquarters at The Penn-Sheraton Hotel
Will be open each evening from Sunday, October 28th, except Wednesday night.
YOU ARE CORDIALLY INVITED TO CALL AND MEET OTHER WIRE INDUSTRY MEN

THERE WILL BE A REGISTRATION FEE OF $11.00 FOR MEMBERS AND $13.00 FOR NON-MEMBERS, INCLUDING AN ANNUAL LUNCHEON TICKET, FOR ALL THOSE ATTENDING THE TECHNICAL SESSIONS AND MEETINGS. PLEASE HAVE YOUR ASSOCIATION MEMBERSHIP CARD WITH YOU AND SHOW IT WHEN REGISTERING.

ADMISSION WILL BE BY BADGE ONLY—PLEASE WEAR IT.

THE WIRE ASSOCIATION PROGRAM COMMITTEE FOR THE 1956 CONVENTION

GENERAL PROGRAM CHAIRMAN
Charles H. Williams, Jr.
Superintendent, Rod and Wire Mills
Pittsburgh Steel Company
Monessen, Pa.

GENERAL ACTIVITIES

EXECUTIVE SECRETARY

Richard E. Brown
The Wire Association
Stamford, Conn.

REGISTRATION

R. S. Spengel, Asst. Exec. Secy.
The Wire Association
Stamford, Conn.

ENTERTAINMENT

Eber J. Hubbard, President
Hubbard Spool Company
Garrett, Ind.

All papers presented at the Convention by members of The Wire Association are eligible for consideration for the Annual Medal Award, and will be voted upon by the Board of Directors at the next Spring meeting of that body.

FERROUS DIVISION

CHAIRMAN

William Mohr, Wire Mill Supt.
The Colorado Fuel & Iron Corp.
South San Francisco, Cal.

COMMITTEE MEMBERS

Sterling Edwards, President
E. H. Edwards Co.
So. San Francisco, Cal.

Frederick H. Parkin
Parkin Chemical Co.
Pittsburgh, Pa.

H. W. Waters, West Mill Supt.
Canada Works, Steel Company of Canada
Hamilton, Ont., Canada

Fred A. Webber, Chief Metallurgist
Wickwire Spencer Steel Div.
The Colorado Fuel & Iron Corp.
Buffalo, N. Y.

Technical papers are preprinted in the October issue of Wire and Wire Products insofar as possible. Titles to papers accepted will be given to The Wire Association and duly copyrighted at the time of publication.

NON-FERROUS DIVISION

CHAIRMAN

Hugo W. Biskeborn, Chief. Engineer
The Ansonia Wire & Cable Co.
Ashton, R. I.

COMMITTEE MEMBERS

Raymond H. Dudley, Chief Chem.
Whitney Blake Company
New Haven, Conn.

Lester D. Fitler, Plant Eng.
Rome Cable Corporation
Rome, N. Y.

Urbain J. H. Malo, Tech. Dir.
The Crescent Company
Pawtucket, R. I.

All wire mill men and wire mill suppliers are invited to attend this convention, see how the Association functions and participate in the activities. Simultaneous technical sessions for Ferrous and Non-Ferrous Divisions are held.

REGISTRATION AND ALL MEETING ROOMS ARE ON THE 17th FLOOR. Please be prompt in your arrival for the technical sessions. Those with rooms for entertainment are requested NOT TO KEEP THEM OPEN during the technical sessions.

MONDAY, OCTOBER 29th

9:00 A.M.
REGISTRATION

10:00 A.M.
DIRECTOR'S MEETING

12:30 P.M.
PROGRAM COMMITTEE LUNCHEON

THE CONVENTION PROGRAM

PENN-SHERATON HOTEL, PITTSBURGH, PA., OCTOBER 29 - NOVEMBER 1, 1956

MONDAY MORNING—

9:00 A.M. Registration Desk opens on the 17th floor.
10:00 A.M. Annual Meeting of the Board of Directors of the Wire Association.
12:30 P.M. Directors' Luncheon for Program Participants. Address of Welcome by Leslie C. Whitney, President, The Wire Association.

MONDAY AFTERNOON—2:00 P.M. JOINT TECHNICAL SESSION—FERROUS AND NON-FERROUS DIVISIONS

CHAIRMAN OF MEETING

Frederick H. Parkin, Parkin Chemical Company, Pittsburgh, Pa.

PAPER: "Draw-Pak" — by Joseph J. Kovaleski, Sales and Application Mgr. Coulter and McKenzie Machine Co., Bridgeport, Conn.

PAPER: "Hot Dip Wire Aluminizing Processes and Alloys" — by John D. Sprowl, Physical Metallurgical Branch Kaiser Aluminum & Chemical Corp., Spokane, Wash.

PAPER: "The Use of Wire for Thermocouples and Accessories" — by Marvin R. Danielson, Mgr., Research Dept. and Raymond E. Thompson, Plant Manager Claud S. Gordon Co., Richmond, Ill.

FERROUS DIVISION TECHNICAL SESSIONS

TUESDAY MORNING—9:30 A.M.

CHAIRMAN OF MEETING

H. W. Waters, West Mill Supt., Steel Company of Canada Ltd. Canada Works, Hamilton, Ont., Canada

PAPER: "Automotive Zigzag Spring Wire" — by W. J. Van Horn, Met. Rod & Wire Div. Detroit Steel Corp., Portsmouth, Ohio

PAPER: "Industrial Diamonds in the Wire Mill" — by Leonard A. Zucker, President Union Wire Die Corp., New York, N. Y.

PAPER: "The Steel Wire Industry in Australia" — by J. K. MacDougall, Rylands Bros. (Aust.) Ply. Ltd. The Wire Mill Div. of Broken Hill Proprietary Co. Ltd. John A. Macpherson, U.S.A. Representative, will deliver the paper.

TUESDAY AFTERNOON—2:00 P.M.

CHAIRMAN OF MEETING

Sterling Edwards, Pres., E. H. Edwards Co., So. San Francisco, Cal.

PAPER: "Heat Treating of High Carbon Steel" — by N. D. Montgomery Pittsburgh Steel Co., Monessen, Pa.

PAPER: "Electromatic Oil Tempered Wire" — by George A. Sweitzer, Metallurgical Investigator Jones & Laughlin Steel Corp., Aliquippa, Pa.

PAPER: "Steel Wire: Some Recent Developments in Europe" — by Reginald S. Brown, Technical Dir. Rylands Brothers Ltd., Warrington, England

WEDNESDAY MORNING—9:30 A.M.

CHAIRMAN OF MEETING

Fred A. Webber, Chief Metallurgist, Wickwire Spencer Steel Div. Colorado Fuel & Iron Corp., Buffalo, N. Y.

PAPER: "Introducing the Nailmaker" — by Richard J. Fisher National Machinery Co., Tiffin, Ohio

PAPER: "Automatic Coil Strapping" — by J. F. Beckman, Asst. Dir. of Sales Signode Steel Strapping Co., Chicago, Ill.

PAPER: "Spiral Wrapping Machines and Materials" — by Harold A. Myers, President and Gen'l. Mgr. Rinkle-Krinkle Paper Co., Boston, Mass.

THE CONVENTION PROGRAM

PENN-SHERATON HOTEL, PITTSBURGH, PA., OCTOBER 29 - NOVEMBER 1, 1956

NON-FERROUS DIVISION TECHNICAL SESSIONS

TUESDAY MORNING—9:30 A.M.

CHAIRMAN OF MEETING

Lester D. Fitler, Plant Engineer, Rome Cable Corp., Rome, N. Y.

PAPER: "Certain Aspects of the Operation and Maintenance of Properzi Continuous Casting and Rolling Mill." — by V. G. G. Nayar, General Manager and K. R. K. Nair, Works Superintendent, The Aluminum Industries Ltd., Kundara, South India

PAPER: "The Progress of the Properzi Process" — by Frank R. Nichols, President, Nichols Wire & Aluminum Co., Davenport, Iowa

PAPER: "Zirconium" — by M. F. Judkins, Mgr. New Products Div., Firth Sterling, Inc., Pittsburgh, Pa.

PAPER: "The Effect of Salts in Formvar on the Dielectric Properties of Formvar Alkyl-Phenolic Coated Magnet Wire" — by Robert E. Kass and Edward Lavin, Research Dept., Shawinigan Resins Corp., Springfield, Massachusetts

TUESDAY AFTERNOON—2:00 P.M.

CHAIRMAN OF MEETING

Urbain J. H. Malo, Technical Director, The Crescent Co., Pawtucket, R. I.

PAPER: "The Control of Insulated Wire Diameter" — by Charles M. Fredrickson, Asst. Plant Supt., Kaiser Aluminum & Chemical Corp., Newark, Ohio and Charles D. Gibbs, Sales Manager, Industrial Gauges Corp., Englewood, N. J.

PAPER: "Polyethylene Insulated High Voltage Power Cable" — by Victor Siegfried, Power Cable Engineer, The Ansonia Wire & Cable Co., Ashton, R. I. and Dr. R. V. Jones, Mgr. of Tech. Services & Development, Phillips Chemical Co., Bartlesville, Okla.

PAPER: "Silicone Insulated Conductors" — by Donald F. Christensen, Electrical Section, Product Engineering Laboratories, Dow Corning Corp., Midland, Mich.

PAPER: "Measurement of Electrical Conductor Characteristics" — by L. F. Roehmann, Senior Research Electrical Engineer, Kaiser Aluminum & Chemical Corporation, Department of Metallurgical Research, Spokane, Washington

WEDNESDAY MORNING—9:30 A.M.

CHAIRMAN OF MEETING

Raymond H. Dudley, Chief Chemist, Whitney Blake Co., New Haven, Conn.

PAPER: "Copper and Copper Alloy Wire for Mechanical Purposes" — by T. E. Veltfort, Manager, Copper & Brass Research Assoc., New York, N. Y.

PAPER: "Drawing Quality Aluminum Wire" — by O. L. Burtenshaw, Senior Metallurgist and R. E. Hutchinson, Wire Drawing Supt., Kaiser Aluminum & Chemical Co., Newark, Ohio

PAPER: "Plasticizers for the Wire and Cable Industry" — by William C. Goodwine, Sales Representative, Tennessee Products & Chemicals Corp., New York, N. Y.

PAPER: "Continuous Production Electroplating of Tin on Copper Wire Using Alkaline Potassium Stannate Bath" — by M. K. Schurter, Development Engineer, Federal Wire and Cable Company, Limited, Guelph, Ontario, Canada and R. T. Gore, Market Development Engineer, Metal and Thermit Corporation, Rahway, New Jersey

WEDNESDAY PROGRAM (Cont'd.)

AT 1:00 P.M.—THE ANNUAL WIRE ASSOCIATION LUNCHEON
(Ballroom, 17th Floor)

LADIES ARE WELCOME LADIES ARE WELCOME

THE PRESENTATION OF AWARDS FOR 1955 PAPERS

MEDAL AWARD: To Allan B. Dove, Research Supervisor, Wire & Wire Products Div., The Steel Company of Canada Ltd., Hamilton, Ont., Can., for his paper: "The Influence of Nail Design and Manufacturing Practice on Joint Strength."

CERTIFICATE OF HONORABLE MENTION (FERROUS DIV.) to Dr. Fritz Schwier, Chief Engineer, Wire Dept., Felten and Guilleaume Carlswerk, Germany, for his paper: "Stress Corrosion and Relaxation of High Carbon Steel Wire for Prestressed Concrete."

CERTIFICATE OF HONORABLE MENTION (NON-FERROUS DIV.) to Robert O. Abbott, Jr., Asst. General Foreman, Bristol Brass Corp., Bristol, Conn., for his paper: "Some Bending Characteristics of Cartridge Brass, 70%, and Yellow Brass, 65%, Wire."

PRESENTATION OF TWENTY-FIVE YEAR CERTIFICATES by Leonard C. Crewe, Jr., Chairman, Board of Past Presidents.

THE MORDICA MEMORIAL LECTURE: "Fulfillment of a Trust," by Kenneth H. Davis, President, The K. H. Davis Wire and Cable Corp., Los Angeles, Calif. This lecture was completed prior to the sudden death of the author on July 10, 1956. The lecture will be delivered by a member of the K. H. Davis Wire & Cable Company organization.

AT 4:00 P.M.—THE ANNUAL MEETING OF THE WIRE ASSOCIATION
This is the annual business meeting of members of the Association. Your personal attendance is needed and urged to discuss proposals and transact business.

Chairman of Meeting
Leslie C. Whitney, President
The Wire Association

IN THE EVENING BALLROOM, 19TH FLOOR

THE ANNUAL STAG SMOKER—DINNER

6:30 P.M.—Cocktail Bar Opens

7:30 P.M.—Dinner and Show

CHAIRMAN, ENTERTAINMENT COMMITTEE: Eber J. Hubbard, Jr.
COME ONE, COME ALL—ENJOY FELLOWSHIP AND A GOOD SHOW!

THURSDAY MORNING—

PLANT INSPECTION TRIPS

FERROUS DIVISION TOUR—Busses will leave the hotel for the 25 mile trip to Monessen, Pa., to visit the Rod and Wire mills of the Pittsburgh Steel Company. The company will provide luncheon for their guests at the conclusion of the tour of their mills, returning all persons to the hotel in the early afternoon.

NON-FERROUS DIVISION TOUR—Busses will leave the hotel for Glassport, Pa., to visit the plant of the Copperweld Steel Corporation there. Distance, about 18 miles. Arrangements for luncheon will be provided. Visitors will be returned to the hotel directly after lunch.

ALL MEN IN ATTENDANCE ARE INVITED TO GO ON ONE OR THE OTHER OF THESE TOURS. BE SURE TO BUY YOUR BUS TICKET IN ADVANCE.

FOR THESE TOURS, ALL PERSONS MUST GO BY BUS. NO PRIVATE CARS MAY BE USED. TO BE ADMITTED, EACH VISITOR MUST WEAR HIS BADGE; NO EXCEPTIONS PLEASE. THESE MEASURES ARE FOR SECURITY, SAFETY AND THE IDENTIFICATION OF VISITORS.

These plant inspection trips conclude the 1956 Convention.

RESEARCH PAPERS ARE PREPRINTED IN THE OCTOBER ISSUE OF WIRE AND WIRE PRODUCTS.

A summary of the discussions and the Mordica Memorial Lecture will appear in the January issue of Wire and Wire Products.

Papers not received in time for preprinting will be published in the November and December issues of Wire and Wire Products.

THE MORDICA MEMORIAL LECTURE

An invitation to deliver the Mordica Memorial Lecture is considered the highest honor within the power of the Board of Directors of The Wire Association to bestow upon a member.

The lecturer is selected each year by the Board of Past Presidents on the basis of outstanding contributions to the wire industry.

The lecture for 1956, entitled "Fulfillment of a Trust" by Kenneth H. Davis, President, The K. H. Davis Wire and Cable Corp., Los Angeles, Cal., will be delivered by a member of his organization due to the untimely death of Mr. Davis on July 10, 1956. The lecture had been completed before his death.

The Wire Association's
ANNUAL MEDAL AWARDS
AND
CERTIFICATES OF HONORABLE MENTION

All members of The Wire Association are cordially invited to submit technical papers either for publication in "WIRE & WIRE PRODUCTS" during the year or for presentation before the Annual Wire Association or the Regional Meetings.

Each year a medal will be awarded the paper selected as being the most meritorious one on wire manufacture or fabrication.

Honorable Mention Certificates are also awarded in the Non-Ferrous and Ferrous Divisions where such awards, in the opinion of the Awards Committee, are merited.

All papers submitted become the property of The Wire Association, and the Board of Directors constitutes the Committee on Awards.

Consideration for the Medal Award is not limited to the papers presented at the Meetings, but is given to all papers contributed by members and published in "WIRE & WIRE PRODUCTS" during the year.

THE TWENTY-FIVE YEAR CERTIFICATES

These certificates of The Wire Association are being awarded by the Board of Directors at the Annual Convention of The Wire Association to those who became members of our society in 1932 and who have been members continuously since that time. These persons are:

KENNETH R. BEARDSLEE
ANSON E. BEIGHLEY
VICTOR J. BOULIN
LEVI M. CASSIDY
PHILLIP W. GRASSELL
S. J. HAMMITT
D. HORSFALL
PETER IGOE
NEIL H. KNOWLTON
ROBERT H. LEACH
LOUIS J. C. LE PAGE
RANDOLPH V. MILLER
JOHN CHARLES MOSTON
HENRY R. PATTERSON
JULIAN L. SCHUELER

COMPLETE, CONTINUOUS WIRE INSULATING SYSTEMS

for

PLASTIC JACKETING
WIRE ENAMELING
CABLE LACQUERING
GLASS and VARNISH INSULATING

FRICTION LETOFFS
DRIVEN LETOFFS
TENSION CONTROL STANDS
CAPSTANS
CONTINUOUS WINDUPS
STRAIGHT AND RETURN-BEND COOLING TROUGHS
CONVECTION AND RADIANT HEATED TOWERS
SYSTEM DRIVES

Write for descriptive literature, specifications, and complete detailed information.

INDUSTRIAL OVENS, INC.
13807 TRISKETT ROAD CLEVELAND 11, OHIO

Government Information

Record-Keeping for the Government

General Services Administration offered the public on August 24th a new guide to the retention of its private records for possible Government audit and examination.

★ ★ ★

The listing appeared as the leading item in the current issue of the Federal Register in which GSA publishes official notices and regulations issued by Federal agencies. The guide filled about the first 51 pages of the Register.

★ ★ ★

Entitled the "Guide to Record Retention Requirements," the compilation revises and brings up to date the first issue of the guide published in the Federal Register of April 8, 1955. The first edition of the guide was one of the most popular items ever to appear in the Register. As a result of its popularity, the issue containing the guide was exhausted, and for the first time in the Register's history (it was first published on March 14, 1936) an issue was sent back to press. Since then 12,000 reprints have been sold.

★ ★ ★

The revised guide embraces all requirements in effect on January 1, 1956, including all those added by laws and regulations in 1955. The new edition, moreover, has been simplified and expanded to include many popular terms.

★ ★ ★

The compilation contains some 867 entries. Each applies to a separate law or regulation or group of similar regulations calling for the retention of records. One entry, for instance, consolidates 100 requirements for milk handling records differing primarily by the area in which the rules are in force.

★ ★ ★

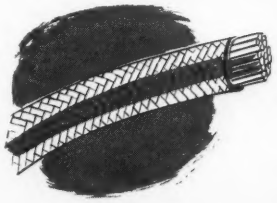
As published in the Federal Register, the list is for public use without carrying, in itself, regu-

from **UNITED...**

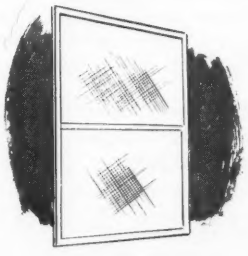
ALUMINUM

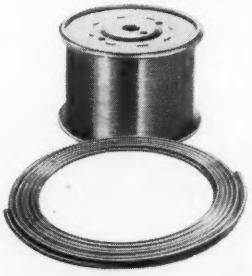
BRASS

COPPER WIRE



as you like it . . . when you need it!





United's quality control builds into aluminum, brass and copper wire the features you like. Features such as these:

Solid drawn wire • Close tolerances • Accurate to size and shape • Uniform temper throughout Available on spools or in coils • Square, half-round and flat shapes available

United's efficient production assures delivery on time, all the time.

For wire as you like it, when you need it, specify and buy United, the quality name in aluminum, brass and copper wire.

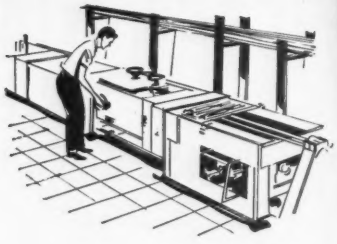
Permanently United

UNITED WIRE

AND SUPPLY CORP.

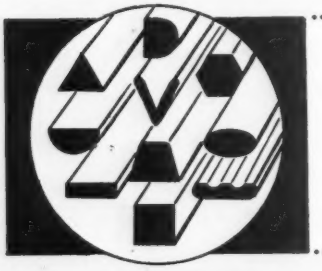
PROVIDENCE 7, R. I. • OFFICES IN PRINCIPAL CITIES

LOOK TO UNITED FOR THE BEST IN ALUMINUM, COPPER AND BRASS TUBE AND WIRE



...cut production costs with CONTINENTAL® Special Shaped Wire

You can engineer greater savings in production when you use Continental round or special shaped wire. Usually you can reduce costs on expensive forging, stamping and rolling operations by using Continental special shaped wire. For product-trim or as a basic component, the right wire can help you cut corners—and you can get the right wire at Continental. We have solved countless problems in supplying wire for thousands of applications, in a great range of sizes and shapes, temper, finish and analysis in low or medium low carbon. Before you fill any wire need—check with Continental, wire headquarters for many firms. Write us today.



STANDARD AND SPECIAL WIRE SHAPES

flat	keystone-shaped
half-round	V-shaped
round	hexagonal
oval	grooved flat wire
half oval	special wire trim designs
square	bread-shaped
rectangular	D-shaped

CONTINENTAL

STEEL CORPORATION • KOKOMO, INDIANA

WIRE SPECIALISTS FOR OVER HALF A CENTURY

Producers of Manufacturer's Wire in many sizes, shapes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

latory force. The guide will enable groups within the public to check in one place their responsibility for holding records of their transactions, activities, or possessions.

★ ★ ★

Dr. Wayne C. Grover, Archivist of the United States, said that preparation of the original list began nearly two years ago.

★ ★ ★

As the first step, requirements were sifted from the laws in the United States Code and the regulations in the Code of Federal Regulations. The latter accounted for nearly 98 percent of the entries. Each agency reviewed the initial list to assure complete coverage and accuracy in reporting what, by whom, and for how long records are to be held.

★ ★ ★

Retention periods run for six months to forever. However, no period is given in about half the rules. For those with set times, the most common period appears to be three years from whatever cut-off date applies.

★ ★ ★

The guide's index illustrates the wide scope of the regulations with 1,400 references to persons, groups, or products to which entries apply.

★ ★ ★

Businessmen subject to the rules include Government contractors, warehousemen, employers, exporters, importers, commission merchants, stock brokers, shipbuilders, tollbridge owners, and so on in great variety.

★ ★ ★

The revised Guide was compiled and indexed by the Federal Register Division. All statements as to record-keeping requirements have been reviewed by the various agencies. Some of the material appearing in the original guide has been rewritten for greater clarity. The material covering the Internal Revenue Service, for example, has been entirely re-done, the first 116 items covering still-effective requirements under the 1939 Internal Revenue Code, the remainder

(items 117-262) covering requirements under the Internal Revenue Code of 1954.

★ ★ ★

A copy of this Federal Register may be purchased from the Superintendent of Documents, Government Printing Office for fifteen cents. Under present plans, the guide will also appear annually in the supplement, Title I of the Code of Federal Regulations.

Stripper for Salvage of Electric Wire and Cable

Howard A. Burwood, Inc., P. O. Box 2115, South Portland, Maine, has developed a line of machines for the stripping of cable components to salvage valuable rubber, plastic and lead coverings and the even more valuable copper and aluminum conductors.

★ ★ ★

These machines have been in service in wire mills and scrap salvage yards for 10 years, giving great satisfaction to their owners. Various models will handle the salvage of these components from the smallest to the largest wires. Model #526, for example, strips cable from 5/16″ to 6″ O.D., by merely turning an adjusting handle.

★ ★ ★

The latest addition to this line is a machine that will remove the jacket from a steel cable cored aluminum conductor, stripping first the insulating jacket, then the aluminum wires, leaving the core wire clean.

★ ★ ★

By doing its own salvage work on rejected or spoiled cable, a company can save large sums over the practice of selling such wire to the junkman.

★ ★ ★

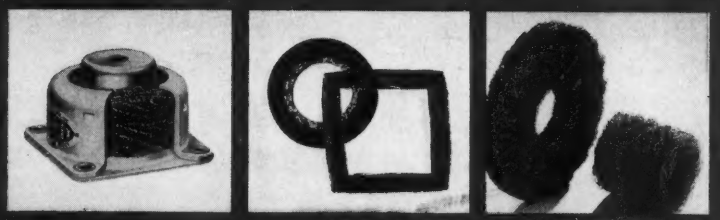
Full information on models suitable to any mill's operations are available upon request.

Isomelt Wire Enamel

A new type of wire enamel was introduced in 1956 by the **Schenectady Varnish Co.,** Schenectady 1, N. Y., said to have a number of advantages, principal among which is its solderability.

Engineers have taken to **KNITTING** with **ALLOY WIRE...**

Look at the results they're getting...



VIBRATION ABSORBING CUSHIONS — ELECTRONIC SHIELDING — FILTERS & MIST ELIMINATORS

If you haven't started to investigate the design potential for knitted stainless steel and nickel alloy wire, now is the time to do it. Here are some interesting applications to whet your interest and imagination:

1. **VIBRATION & SHOCK ABSORBING CUSHIONS**—used to protect intricate, expensive electronic equipment in aircraft. Alloy wire is unaffected by high temperatures, low temperatures, moisture and other elements.
2. **ELECTRONIC SHIELDING**—knitted alloy wire gaskets eliminate radio interference in electronic equipment. Nickel alloy wire has good conductivity, corrosion resistance and resiliency.
3. **FILTERS & MIST ELIMINATORS**—knitted wire pads remove entrained liquids from gas streams with exceptionally low pressure drop. Shaped cartridges widely used for oil and other liquid filters.

Many other industrial applications take advantage of the outstanding properties of knitted alloy wire. Learn more about these interesting products . . . send today for Application Bulletin A-1.

ALLOY HKP

ALLOY METAL WIRE DIVISION

H. K. PORTER COMPANY, INC.
Prospect Park, Pennsylvania

EFFICIENT, MODERN SYSTEMS

FOR

ELECTRICAL WIRE & CABLE MANUFACTURING

• *CABLE LACQUERING SYSTEMS*

Conventional cellulosic, or other type, lacquers are applied in successive continuous coats from one to twenty-eight coats over fibrous braid wrapped primary conductors. One end, four ends, or eight ends of wire are handled continuously. System includes letoff, application, drying and constant tension takeup equipment.

• *WIRE ENAMELING SYSTEMS*

Natural and synthetic enamels, silicones, solution nylon, modified plastisol, and similar insulating coatings are applied to bare, cotton or glass covered wire in round, square or rectangular cross section. Ten or twenty simultaneous strands are handled. Systems are complete with letoff, preannealer, application system, capstan and multiple takeup unit.

• *ASBESTOS INSULATING SYSTEMS*

Carded asbestos is applied to continuous single conductor as an integrated operation with saturating, rotary forming, drying, cooling and polishing of the finished wire. Wire from No. 20 gauge to No. 6 AWG is handled through an asbestos wall thickness range of from .008″ to .040″ thickness in a single pass.

• *RUBBER OR PLASTIC JACKETING SYSTEMS*

Rubber and thermoplastic jacketing compounds are continuously applied to electrical wire or cable by the extrusion method. High speed, constant tension letoff and takeup equipment, controlled cooling or continuous vulcanizing equipment are powered by synchronized range drives as complete, integrated wire handling systems. Extrusion machines of customer's choice are furnished.

• *GLASS & VARNISH COATING SYSTEMS*

Double layer of glass or cotton wrapping is applied to round, flat or square conductor. Two individual coatings of high temperature varnish are applied and the finish baked in a continuous operation. Units are complete from letoffs to takeup frames.

• *SELF TRAVERSING REEL CORD DRYERS*

These ingenious machines are used to remove hygroscopic moisture from fibers, braided or knitted flexible cable. These machines increase extrusion speeds, reduce blister scrap loss and improve diameter control. They are easily installed in existing extrusion line.

TECHNICAL INFORMATION ON ANY OF THESE PROCESSES UPON REQUEST

C. A. LITZLER CO., INC.

1817 BROOKPARK ROAD

CLEVELAND 29, OHIO

It is called Isomelt Polyurethane Wire Enamel, the chief ingredient being polyurethane resin. Due to the recent reduction in the price of this resin, the company has announced a price reduction of 30% in the cost of the enamel, which in turn makes possible the lowering of the cost of wires enamelled with the product.

NEMA to Hold Annual Convention in November at Atlantic City

Plans for the annual convention of the **National Electrical Manufacturers Association,** which opens November 12 at the Traymore Hotel, Atlantic City, N. J., will follow the policy established last year of providing a program of interest to representatives of all NEMA member companies whether or not their product section meetings coincide with the convention.

★ ★ ★

In making this announcement, **Joseph F. Miller,** NEMA's managing director, said that the new convention policy, given a successful trial in 1955, resulted in attracting more company executives than has been the case at previous annual meetings. Former NEMA conventions usually were a series of concurrent sessions of product groups. Representatives attended, generally, only if their particular groups were meeting during the convention period.

★ ★ ★

The new program policy is geared to draw company representatives and their wives to the convention regardless of product sessions by means of oustanding "work and play" features for both.

★ ★ ★

More than 600 leading executives of electrical manufacturing companies from across the nation are expected to attend the 1956 convention which will feature two events of unusual interest to Association members: a general membership luncheon on Tuesday noon, November 13, at which the speaker will be one of the nation's top industrialists, and an all-professional show dramatizing NEMA's

place in the industry, aimed at creating a bigger and more vital role for the electrical manufacturer in the nation's economy, arranged for Wednesday afternoon, November 14, following a luncheon meeting at which new Association officers will be presented.

Editorial Correction

On page 904 of the August issue of Wire and Wire Products some printer's errors in the article "More and Better Wire From Each Diamond Die", arising from transposing some lines to points where they did not fit, resulted in some gobbledegook results.

★ ★ ★

Beginning near the bottom of the first column and carrying over to the top of the third, the correct text should read:

" 'Commercially perfect' dies should be inspected with microscopes, up to, but not exceeding 30 power on the fine sizes, (.0015" and smaller), and on the larger sizes only up to 10 power. Any die which is to pass examination through a more powerful lens or which is produced to any special specifications should be considered a custom-made die.

★ ★ ★

"The statements which preceded the above, proposed Standards for die size and quality, do not depend entirely upon an investigation of the present situation. We feel the points are well-grounded as they are based upon an exhaustive study of the use of diamond wire-drawing dies over a long period of years. Some of this experience was gained during the World War II emergency when the writer of this review had the problem of bringing about sufficient manufacture in this country of a product which our diemakers were not accustomed to making, namely, the small diamond die, (.0015" and smaller). New Production media, testing methods, inspection techniques, performance records by quantity and quality and the care with which the dies were used, re-sized and polished, also came under his supervision. This successful work, for the War Production Board, was furthered by the Bureau of Standards and by American mineral physicists.

★ ★ ★

"To sum up, the continuation of a situation which has already lasted for years cannot be conducive to the production of diamond dies that will draw the greatest amounts of wire in a production line."

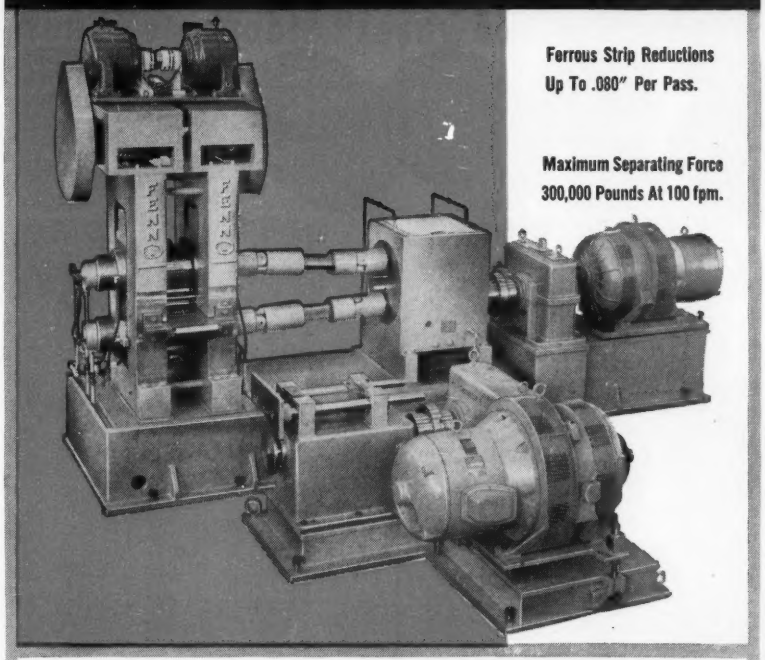
★ ★ ★

Incidentally, the text as approved to the printer in page form was correct. We regret any inconvenience that may have been caused to our readers by this error.

FENN INTRODUCES A . .

NEW LARGE

LABORATORY ROLLING MILL



Ferrous Strip Reductions Up To .080" Per Pass.

Maximum Separating Force 300,000 Pounds At 100 fpm.

PERMITS HEAVY REDUCTIONS IN THE LABORATORY ON FERROUS STRIP

Fenn's new Model 4-083 Combination Type Laboratory Rolling Mill, a companion to the popular smaller Fenn Mill, is capable of taking heavy reductions on ferrous strip at all speeds between 100 fpm and 500 fpm. The mill (2½" x 8⅜" x 8") can be used as a two-high mill, or as a four-high mill featuring driven back-up rolls or work rolls, and many drive combinations are possible to meet customer specifications. Important features of the new mill include a dual motor power screw-down unit, force feed lubrication system, and auxiliary operator control stations.

FENN

COMPLETE MILL SPECIFICATIONS
sent upon request.
Fenn engineering service is available to help you solve your rolling problems.

Precision Rolling Mills

Turks Heads

Wire Shaping Mills

Swaging Machines

Wire and Tube Drawing Machines

FENN MANUFACTURING CO., 604 Fenn Road, Newington, Conn.

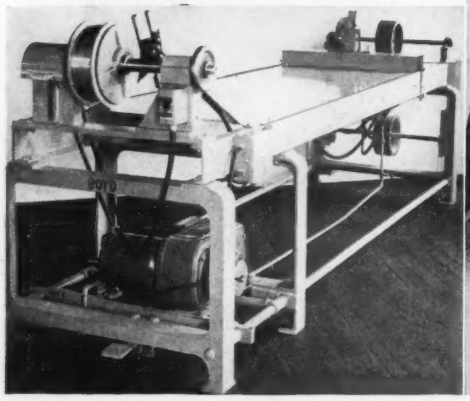
BOYD and SONS RECOMMEND

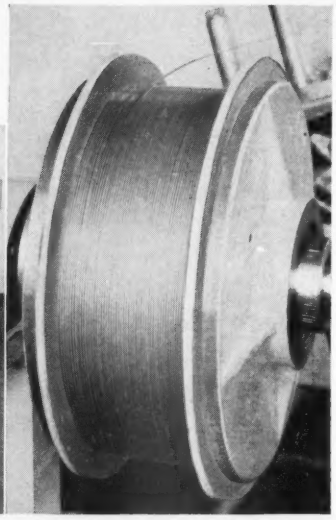
CARRIS

Non-Returnable Presdwood and Hardboard

SPOOLS

FOR THEIR
BOYD
MICRO-SPOOLER





Carris Non-Returnable Presdwood and Hardboard Spools have all the features that make them the perfect Spools for use on the Boyd Micro-Spooler.

WIND
TRUER

MORE
UNIFORM

Made to Your
Specifications

CLOSE
TOLERANCES

Write, Wire or Phone PRospect 3-7388 for Your Requirements

OUR OWN TRUCKS GIVE YOU ALMOST INSTANT DELIVERY

CARRIS REELS, INC.
70 PARK STREET RUTLAND, VERMONT
SPECIALISTS IN THE DESIGN AND MANUFACTURE OF PLYWOOD REELS AND SPOOLS

Copper and Copper-Alloy Wire for Mechanical Purposes

(*Continued from page* 1214)

is frequently essential not only where the wire is used for ornamental purposes, such as for instance, in jewelry but also in industrial uses where it is necessary to match the color of the wire with other components of the article. The color varies widely with the composition of the alloy, all the way from the copper red, which persists up to about 5% zinc, through a bronze color at about 10% zinc, a red golden color at about 15% zinc, a yellow golden color at about 25% zinc, to brass yellow at about 25% and 38% zinc. With a greater content of zinc the alloy again takes on a red characteristic.

★ ★ ★

The nickel silvers in general have a pleasing white color. As little as 5% nickel gives a yellowish white color, 10% gives a white color with a slight tinge of yellow remaining, and with 15% or more of nickel the color is clear white.

Mill Processes

In general, the making of copper-alloy wire begins with the melting and blending of a precise mixture of virgin metal and high grade scrap in an electric furnace to cast a cylindrical billet of a uniform and homogeneous alloy. After the gate or top of the billet is trimmed off, the billet is cut into smaller billets of convenient size. For further processing the billets are heated to a carefully controlled temperature, mixed city gas or propane being commonly used. For speedier results heating by electrical induction coils is being introduced. Good surface on the billets is assured by "sleeving" off the outside skin of the billet while it is being extruded. In the extrusion process the billets are passed through dies in powerful hydraulic presses, emerging as from one to five rods.

★ ★ ★

The glowing rods leaving the extrusion presses are cooled with a water spray. After pickling to remove surface oxidization the rod is cold-drawn through a series of dies successively reducing the diameter. In the final steps the small

diameter material is drawn through dies onto coilers to form the finished wire. Intermediate and final annealing is included depending on the alloy, the degree of reduction, and the final characteristics desired.

★ ★ ★

The rod from which wire is drawn is in some cases hot-rolled from billets in a series of passes through a grooved mill, or cold-rolled from square bars.

★ ★ ★

High-copper-alloys and others which are not readily extruded may be cold-rolled from billets. Rod thus produced is then drawn down to wire by processing similar to those used for extruding rod. Another process which is coming into use for such alloys starts with a continuous cast rod from which the wire is drawn.

★ ★ ★

Wire drawing equipment is constantly being elaborated and improved with the objective of faster production and improved quality. The newest of such equipment permits a very high percentage of reduction from the rod to the wire sizes. The important point is that a variety of processes have been developed and adjusted to the requirements of the particular alloy being worked and the characteristic of the wire which is to be produced.

★ ★ ★

Inspection is frequent and quality control has been extensively adopted, both to assure an end product which will satisfactorily meet the customers' specifications and to minimize scrap and needless operations in the mill.

Fabrication Processes

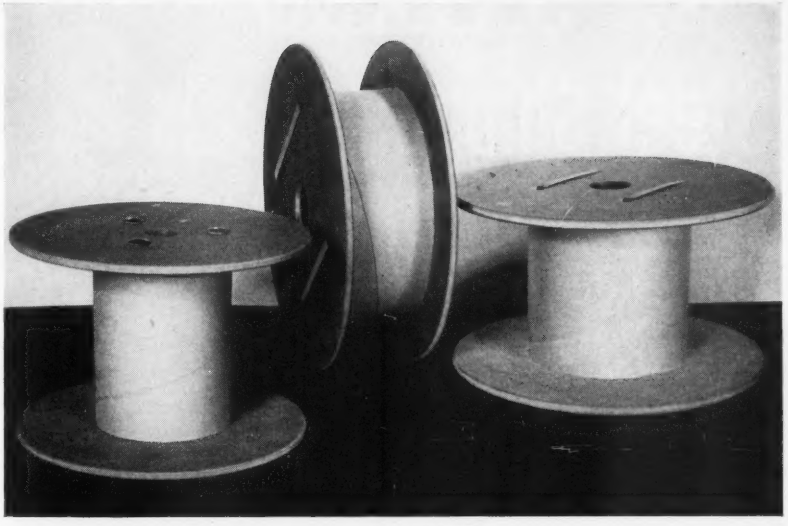
The fabrication processes for which mechanical wire must be supplied are nearly as diversified as the applications. Such processes include drawing, heading, threading (either by rolling or

ESPECIALLY DESIGNED FOR WELDING WIRE AND THE AIRCOMATIC WELDING PROCESS

CARRIS

Non-Returnable Presdwood and Hardboard

SPOOLS



Saves you

COSTLY FREIGHT

HANDLING COSTS

VALUABLE PLANT SPACE

You buy better Non-Returnable Spools when you choose Carris. They wind truer, are more uniform and are designed by men with a practical knowledge of the Wire Industry's needs. Write, wire, or phone Prospect 3-7388 your requirements. Our own trucks give almost instant delivery.

CARRIS REELS, INC.

70 PARK STREET RUTLAND, VERMONT

SPECIALISTS IN THE DESIGN AND MANUFACTURE OF PLYWOOD REELS AND SPOOLS

...and here's why!

Now you can enjoy lower freight charges and greater protection against damage with the new, lighter weight NYECO steel reels. They cost so little more, last 12 times longer than wooden reels, require minimum maintenance. Rugged weatherproof, splinter-proof, warp-proof protection protects costly cable against damage due to dropping, bouncing, rough handling.

Think it over and you'll agree that it doesn't pay to risk an investment of thousands . . . and your reputation . . . on inferior reels.

These leading mills are just a few of the many that use NYECO Steel Reels: ANACONDA, GENERAL CABLE, OKONITE, PHELPS DODGE, ROEBLING, WESTERN ELECTRIC

- *ANY QUANTITY*
- *ANY SIZE*
- *ANY LOAD*
- *FLANGE DIAMETER From 36" UP*

Write • Phone • Wire

NYECO

Specialists to the Wire Industries for Over 45 Years

NEW YORK ENGINEERING COMPANY

75 West Street, New York 6, N. Y.

TELEPHONE: WHitehall 4-5380 **CABLE:** NYECO, N. Y. **PLANTS:** YONKERS, N. Y.

cutting), forming, spinning, peening, upsetting, stamping, knurling, machining, soldering, brazing, welding and riveting.

Selection of Wire

It is obvious from the above that the selection of the appropriate alloy for a given application cannot be considered in general terms. In the wide range of applications for which copper and copper-alloy mechanical wire is available, the problem involves such factors as the fabrication process to which the wire will be subjected, the desired characteristics of the end product, color, cost, and the general availability of the alloy, and even such a factor as scrap. Unless experience is available to the user from the actual processing of wire of a given alloy, it would appear desirable for him to consult the individual mills which are prepared to control the temper and other characteristics of the wire to meet the fabrication process. In ordering wire most mills urge the users to specify alloy, temper, strength, size of coils (preferably both inside and outside diameters) and weight. To avoid confusion the use of decimals and fractions for dimensions is much preferred to the use of gauge numbers.

Conclusion

Where a product, such as copper and copper-base alloy mechanical wire, is available in such numerous varieties and is subject to such diversified applications, it is manifestly impossible in a paper of this kind even to cover broadly the relations of the characteristics to applications. The purpose of this paper will have been served if it calls to your attention the wide range of properties which can be obtained in such wire, the probability that the outstanding characteristics of copper and its alloys can be utilized to advantage and that the detailed information which is necessary to fit the product to its use, is available both through the Association and the individual mills.

Outstanding Personalities of the Wire Industry

Sales Executive Appointed by Howe Scale

The appointment of **F. E. Pringle** as assistant general Sales Manager for the **Howe Scale Company** has been announced by **Richard F. Straw,** Vice President in Charge of Sales.

★ ★ ★

Mr. Pringle attended the University of Kansas, Illinois Institute of Technology and Northwestern University, and comes to Howe from Sperry Products, Inc., where for the past eight years he held sales and sales management positions.

★ ★ ★

In making this announcement, Mr. Straw points out that the creation of this new post in the Howe organization is indicative of the increased activity and sound growth of the company.

★ ★ ★

The Howe Scale Company of Rutland, Vermont, founded in 1857, manufactures complete lines of industrial scales, weight recorders, automatic batching equipment and over-the-floor materials handling equipment.

F. E. Pringle

Tom M. Girdler Retires

Tom M. Girdler, chairman of the board and a director of the **Republic Steel Corporation** for over twenty-five years, retired on August 21st.

★ ★ ★

Mr. Girdler was born on a farm in Indiana 79 years ago and began his education in a little red schoolhouse.

★ ★ ★

He graduated from Lehigh University in 1901 and started his business career as a foreign sales representative for the Buffalo Forge Co. Later he became successively associated with Oliver Iron and Steel, Colorado Fuel and Iron, and Jones and Laughlin. He joined the last in 1914 as assistant superintendent and was president when he left them in 1929, becoming chairman of the newly created Republic Steel Corporation in 1930,

CAMDEN WIRE CO., INC.

Wire Fabricators

Producers of Quality Fine Wire Copper Conductors

EXTRA FLEXIBLE CONDUCTOR STRANDED OR BRAIDED

MULTIPLE ENDS OF SIZES .008 to .002

BARE • TIN or LEAD COATED • SILVER PLATED

Special Heavy Tinned Conductors for Hook-up Wire

40 MASONIC AVENUE • CAMDEN, NEW YORK

which was formed by the merger of four producing and fabricating steel concerns.

★ ★ ★

One of his sons, **Tom M. Girdler, Jr.,** carries on the Girdler name in Republic Steel at Massillon, Ohio, where he is Assistant Division Manager of its Union Drawn Steel Division.

★ ★ ★

Mr. Girdler is succeeded as chairman by **Charles M. White,** formerly president. **T. F. Patton,** formerly assistant president and first vice president, was named president by the board.

Schatzel Honored at ASTM Meeting

Dr. Rudolph A. Schatzel, ASTM's President, was honored at the President's National Luncheon, during the Pacific Area meeting in Los Angeles on September 19th.

★ ★ ★

He has been Vice-President and Director of Engineering, Rome Cable Corporation, Rome, N. Y., since 1945. Born in Kingston, N. Y., he received a BS in Chemistry from Union College in 1921 and MS in 1923. In June 1956, Union College conferred the honorary degree of Doctor of Science. He was Research Chemist, General Electric Research Laboratory, and later took graduate work and instructed at M.I.T. Since 1924, Dr. Schatzel has distinguished himself in research and development work on electrical cable insulations, particularly rubber and plastics. He had previously held top executive positions with the **General Cable Corp.,** and its predecessor the **Rome Wire Co.**

★ ★ ★

In ASTM Dr. Schatzel has been particularly active in Committee D-11 on Rubber and Rubber-Like Materials where he is a member of several subcommittees and was for many years Chairman of Subcommittee V on Insulated Wire and Cable. He now serves on Committee B-1 on Wires for Electrical Conductors. He has written many technical papers, holds numerous patents, and has contributed to various textbooks in his field.

Alloy Metal Wire Announces Sales Changes

The sales department of **Alloy Metal Wire Division** has undergone reorganization and expansion for greater coverage and increased efficiency. The following changes have been announced by **Peter Stefan,** sales manager:

★ ★ ★

W. J. Luster was appointed district sales manager of the New Jersey territory with offices in East Orange, N.J. He has been in the alloy sales department for 26 years.

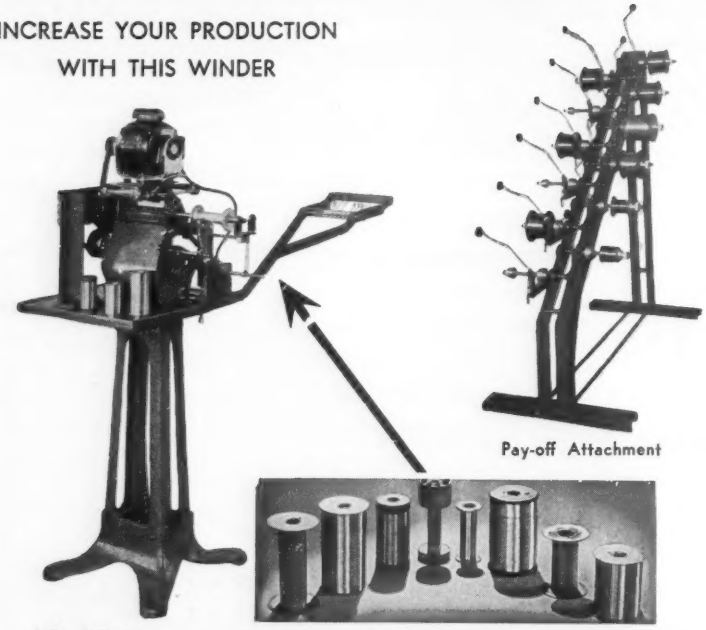
★ ★ ★

E. F. Hirsch was appointed district manager of the recently organized New York City area, which includes Connecticut. **Douglas C. Dean,** formerly associated with Riverside Metal Division, will assist Mr. Hirsch as sales representative in this district. The East Orange office will also serve this area.

★ ★ ★

STANDARD UNI-DRIVE WIRE WINDER.

INCREASE YOUR PRODUCTION WITH THIS WINDER



Pay-off Attachment

Wire Winder

Various types of supply packages that may be wound on Standard Uni-Drive Wire Winder.

PAYOFF

Our payoff attachment is made with self-aligning ball bearings and a compensating attachment to control the tension of each end. Applies same tension when spool is empty as when full.

The new Uni-Drive Winder with Payoff Attachment is new in design and incorporates several improved and tested features. Production is stepped up through increased speed. It produces smooth, even and accurately wound spools of wire in single or multiple ends. All strands parallel—no over or under-winding. Automatic Stop-Motion controls each strand. Compensating attachment produces perfectly controlled tension. Traverse adjustable from 1¾" to 5½" between spool heads without changing cam. Designed especially for winding wire to be braided and shielded for electrical conductors up to ¾" diameter.

Payoff can be equipped with Carboloy Guide Inserts at additional cost.

STANDARD MILL SUPPLY COMPANY

PAWTUCKET, RHODE ISLAND, U.S.A.

31 Esten Avenue

PAwtucket 3-1534 — 3-1535 — 3-1536

W. E. Sweeney, who is district sales manager for the Riverside Metal Division, will also handle the sales of Alloy Metal Wire Products in New York State and northern Pennsylvania, out of his office at Rochester, N. Y.

★ ★ ★

John L. Hoffman has recently joined the sales department. He was formerly associated with United Air Lines in a supervisory capacity.

Sebald Retires; Gray Elected President of Armco

After 50 years with the **Armco Steel Corporation,** during which he rose from office boy to president, **W. W. Sebald** resigned from the presidency, a position he has held since 1948.

★ ★ ★

R. L. Gray, executive vice president, has been elected president of Armco, **Charles R. Hook,** chairman of the board, announced.

★ ★ ★

Mr. Sebald will continue in an executive capacity as vice chairman of Armco's board of directors. He also succeeds Mr. Hook as chairman of the board's executive committee.

★ ★ ★

Mr. Gray entered the engineering school of Washington University at St. Louis and was graduated as an electrical engineer.

★ ★ ★

He joined a steel forgings company in the St. Louis area, and soon became works manager. When the plant was acquired by the **Laclede Steel Company,** he rose to the position of chief engineer.

★ ★ ★

In 1923 he went to Kansas City as chief engineer of the Kansas City Bolt & Nut Company. Two years later he was named assistant to the president.

★ ★ ★

In 1925 his Company's name was changed to **Sheffield Steel Corporation,** and Mr. Gray was elected vice president. When Sheffield became an Armco subsidiary in 1930, he was made its president.

★ ★ ★

In 1940, Mr. Gray was elected to the Armco board of directors, and in 1954, following Sheffield's integration as a division of the parent company, he was elected executive vice president of Armco.

Heads Wire Product Firm

Eric A. Johnson, Jr. has been elected president of **Inland Wire Products Co.,** 3947 So. Lowe St., Chicago. He succeeds his father, who retired after 30 years with the company.

Given New Pennsalt Assignments

C. Brooks Ricca has been named Philadelphia District Sales Manager for Pennsalt Chemicals' Metal Processing Products, and **James Carlin** has been assigned to the field sales staff, department manager **John M. Davidson** has announced.

★ ★ ★

A graduate of Villanova, Mr. Ricca has been a Pennsalt representative since 1950 handling sales of its metal cleaners, FOS coatings

USERS OF THESE CABLE REEL BORERS REPORT

PRODUCTION INCREASES UP TO 500%

In one single operation, this remarkable machine bores ALL the holes in a wooden cable reel head. In addition, it has the exclusive Root Patented Hydraulic Feed which provides a stepless range of feed from 2 to 29 strokes per minute. Operator is not handicapped by limited feed rate. This increases production tremendously. Can also be used for other boring purposes. Made in three sizes. *Write for Bulletin No. 132.*

"Can honestly say this machine alone has increased our production over 200%! Our profits increased 100%!"
V. Fairhurst, Mgr. New England Reel and Lumber Co.

ROOT
HYDRAULIC FEED
REEL BORER

Root Reel Borer being used by New England Reel & Lumber Co.

B. M. ROOT CO **YORK, PA.**

ALUMINUM versus COPPER • • •

Announcing the one and only **LEONIC "X",**

a newly developed and Government tested

COPPERPLATED ALUMINUM WIRE

drawn down to .0031″ with a coating thickness up to .001″ that has passed the severest adhesion tests. Here is a NEW wire that combines the advantages of aluminum and copper.

For information write or telephone:

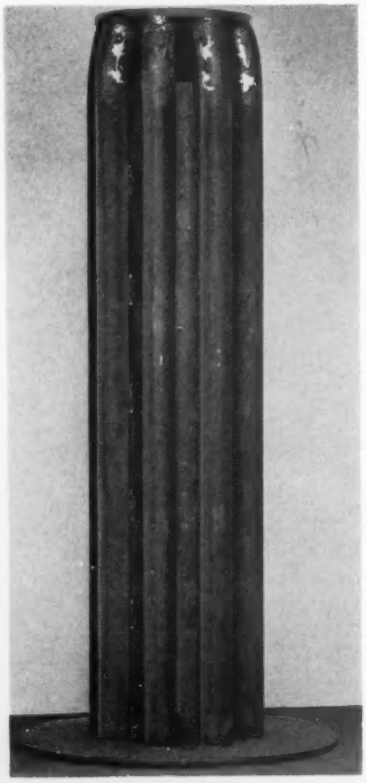
AMERICAN LEONIC MANUFACTURING CO.

Westinghouse Building

3001 WALNUT STREET • PHILADELPHIA 4, PENNSYLVANIA

Telephones: BAring 2-4452 & BAring 2-4453

Specialists in silver plating, gold plating and tin plating of copper and aluminum wires. Volume producers of stainless steel, brass, nickel and nickel alloys in fine sizes.



TOPS!

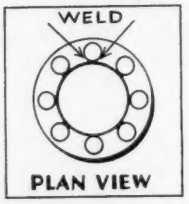
Since 1949—When The First KIF Annealing Spider Was Sold—Not One Has Needed Repair Or Replacement

- Minimizes Warping Due to Annealing.
- Eliminates Discarding of Spiders Either Warped or Impossible to Load or Strip.
- Reduces Friction in Loading and Stripping.
- Minimizes "Down-Time."

HEIGHT IS 81 INCHES.

DIAMETER— 10 TO 30 INS.

REMOVABLE OR SOLID BOTTOM PLATES.



"SAVES PRODUCTION DOLLARS"

Write for literature and quotations to . . .

KIF

INDUSTRIAL FABRICATORS

A Division of

THE ALFRED B. KING CO.

Devine St., North Haven, Conn.

and cold forming lubricants for the metal processing industry.

★ ★ ★

James Carlin was educated at Drexel Institute and has been a member of Pennsalt's Metal Processing Products staff since 1947. He had been assistant to the manager of sales.

Development at Sequola

Sequola Process Corp., Redwood City Calif., has announced a number of staff appointments.

★ ★ ★

W. W. Valentine has been elected president to replace **Paul M. Cook,** who took leave of absence due to ill health.

★ ★ ★

The company's Executive Vice President, **Beardsley Graham,** has been elected to the Board of Directors.

★ ★ ★

Harry G. Burd, former president of **Superior Wire & Cable Co.,** Hickory, N.C., has been appointed special consultant on its telephone cable manufacturing.

★ ★ ★

Emmette F. Gumm, formerly sales manager of **The Cook Mfg. Co.,** Paterson, N.J., has been placed in charge of the company's new sales office and warehouse at 17 William St., Newark, N.J.

BISRA Appointments

Dr. J. Pearson, Ph.D., M.Sc., F.R.I.C., Assistant Director of the **British Iron and Steel Research Association,** on September 1st took charge of the Sheffield Laboratories with his office at Hoyle Street, Sheffield, 3. He will retain the Headship of the Steelmaking Division but will relinquish control of the Chemistry Department for which E. W. Voice, Head of the Ironmaking Division will become responsible. **R. Mayorcas** will be appointed Deputy Head of the Steelmaking Division.

★ ★ ★

J. G. Wistreich, who has been Head of the Metal Working Laboratory at Hoyle Street, has become Head of the Mechanical Working Division, as **W. C. F. Hessenberg,** Deputy Director of BISRA, has relinquished control of the Division in order to devote his time to other duties. **S. S. Carlisle,** Head of the BISRA South Wales Laboratories, becomes Deputy Head of the Division.

Standard Wire & Cable Appointment

Announcement has been made of the appointment of **John M. Cooner** as General Sales Manager for **Standard Wire and Cable Co.** and the affiliate company, **Bucky Harris Co.** According to **I. M. Harris,** president of both corporations, Mr. Cooner, who has been in the Sales Department for five years, assumed his new duties on August 15th.

★ ★ ★

Standard is engaged in the sale and distribution of electrical wire and cable for the missile, electronics and electrical manufacturing industries. Bucky Harris Co. acts as manufacturer's representative for several eastern electrical wire

Far greater production in less space with lower cost equipment . . . for all steel and non-ferrous wire.
The fastest, most uniform way to heat treat wire* is often far lowest in cost!
AJAX
HULTGREN
electric SALT BATH furnaces
* Write for case history bulletins on Ajax Electric Salt Baths for
Annealing
Patenting
Cleaning, Preheating
Descaling
Fluxing for Aluminizing
AJAX ELECTRIC COMPANY
928 Frankford Avenue • Philadelphia 23, Pa.
ASSOCIATED COMPANIES:
AJAX ELECTRIC FURNACE CORP. • AJAX ELECTROTHERMIC CORP. • AJAX ENGINEERING CORP.

mills, serving the Pacific Coast area.

★ ★ ★

Mr. Cooner will be in charge of sales in the Los Angeles, Seattle and San Francisco offices.

Operating Executives Named

The Cambridge Wire Cloth Company, Cambridge, Md., has announced the appointment of **Everett C. Creighton, Jr.** as Plant Manager and **Clifford R. Pink** as Superintendent of the Wire Cloth and Fabrication Department.

Willey's Carbide Appoints Executive

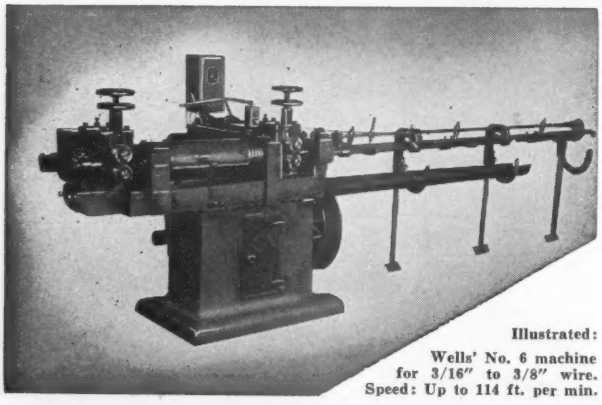
Alfred D. Stevens has been appointed assistant general manager of **Willey's Carbide Tool Co.,** Detroit. He will be responsible for the newly expanded carbide metal manufacturing division. Mr. Stevens has 13 years experience in industrial carbide development and manufacturing. He is a graduate metallurgical engineer from Michigan State University and formerly quality control manager of Kennametal, Inc.

Experience • Reputation • Workmanship

HAVE ALL COMBINED TO MAKE

WELLS STRAIGHTENERS & CUTTERS

NOTED FOR DEPENDABILITY SPEED AND ECONOMY



Illustrated: Wells' No. 6 machine for 3/16" to 3/8" wire. Speed: Up to 114 ft. per min.

WELLS MACHINES ARE PREFERRED WHERE CONTINUOUS HIGH PRODUCTION AND ACCURACY ARE FACTORS OF IMPORTANCE

TIME-TRIED TESTED & TRUE.

WELLS STRAIGHTENING AND CUTTING MACHINES have won the reputation of being highly dependable, with ability to stand up even on the most trying and difficult jobs. The satisfaction that our customers enjoy can be yours, if you equip your plant with WELLS machines.

The No. 6 model illustrated above will cut in lengths of 7½" to 25'. A full line of WELLS machines is built for all gauges of wire and straightening and cutting jobs.

Write for catalog showing all machines

Frank L. Wells Company

5821 FIFTH AVENUE • KENOSHA, WISCONSIN

Builders of Fine Wire Working Machinery

To Manage Titusville Plant

Elmore H. Broadhurst, former Works Manager of the Titusville, Pa., plant of the **Universal-Cyclops Steel Corp.** has been named General Manager — Cyclops Division, effective September 1, 1956.

★ ★ ★

In his new capacity, Mr. Broadhurst will assume full responsibility for all operating, administrative, and technical activities of the division, reporting directly to the President.

Appointed General Foreman

Appointment of **Robert A. Rothacker** as general foreman of **Republic Steel Corp.'s Union Drawn Steel Division** plant in Beaver Falls, Pa., has been announced by **Horace B. Anderson,** superintendent.

★ ★ ★

He succeeds **Clyde H. Pfleghar,** who died recently.

★ ★ ★

He was plant industrial engineer until his new appointment. He will serve under Mr. Anderson in directing all production at the plant. The plant employs approximately 220 persons.

★ ★ ★

He joined Republic in 1942 as an industrial engineer at Union Drawn's plant in Massillon, Ohio, and was transferred to Beaver Falls in 1948 as plant industrial engineer.

To Head Laboratory

The appointment of **Donald L. McClenahan** as Chief Engineer of the newly formed Electrical Testing and Development Laboratory has been announced by the **Schenectady Varnish Co., Inc.,** of Schenectady, N. Y.

★ ★ ★

In his new capacty, Mr. McClenahan will be responsible primarily for the preliminary evaluation of new, high-temperature resins and varnishes developed in the firm's existing research and development laboratories for use by the electrical industry. He will be located at Company headquarters in Schenectady, N. Y.

Appointed Welding Engineers

Crucible Steel Company announces the appointment of **Walter Slinger** and **Benjamin F. Doty** as Welding Engineers with headquarters at Crucible's New York Branch, Harrison, N.J. They will both report to **J. A. Goodford,** Chief Welding Engineer.

★ ★ ★

This assignment of Messrs. Slinger and Doty is part of the company's overall expansion in the field of service activity and promotion in the use of stainless steels and the fabrication of stainless steel products. Crucible manufactures a complete line of stainless steel welding rods and electrodes.

P. C. Borax Appointments

Pacific Coast Borax Company Division of **United States Borax & Chemical Corp.** has announced the appointment of **Lloyd L. Fusby** as Western Manager, and **Roger W. Hinchman** as General Sales Manager.

★ ★ ★

In making these two appointments **J. F. Corkill,** Vice President and General Manager, said that Mr. Fusby will continue to make his headquarters in Los Angeles and Mr. Hinchman will remain in the Division's headquarters in New York.

Adams New Head of J. & L.

Avery C. Adams, president of **Pittsburgh Steel Co.** since 1950 and architect of its multi-million-dollar "Program of Progress," has been elected president of **Jones & Laughlin Steel Corp.,** the nation's fourth biggest steel producer.

★ ★ ★

Mr. Adams, who rebuilt faltering Pittsburgh Steel into the twelfth ranking steel firm, succeeds **C. L. Austin,** who was elected vice-chairman of the board and chairman of the newly formed finance committee. Both changes became effective Oct. 1st.

★ ★ ★

At the same time, Pittsburgh Steel announced the election of **Allison R. Maxwell, Jr.** as president to succeed Mr. Adams. Mr. Maxwell, a veteran of twenty-one years in the steel industry, had been director and vice president, sales.

Victor A. Spoehr

Victor A. Spoehr, 59, former vice president-general manager, of the **H. M. Harper Co.,** Morton Grove, Ill., died on August 8, 1956.

J. M. Schaeffer

Joseph M. Schaeffer, 71, president of the **Waterbury Farrel Foundry & Machine Company** died on September 7th at the Waterbury Hospital following a brief illness. He was widely known as an authority in the field of cold process bolt, nut and screw machinery. He was elected president

Use HEANIUM®
NO 88007
MADE IN U.S.A.
2
.2756 I.D.
NEW DEPARTURE BALL BEARING No 88007
INSERTED IN NYLON
the NEW material that withstands hi-speed pressure of wire by the tons
PULLEYS ARE AVAILABLE IN VARIOUS SIZES AND WITH BEARINGS OR BUSHINGS AS SPECIFIED
If guide wear is a problem in your mill . . .
try Heanium®
IS THE BEST GUIDE TO LOW COSTS.
HEANY INDUSTRIAL CERAMICS CORP.
NEW HAVEN 3, CONNECTICUT

in 1954, climaxing 51 years of service with the company.

★ ★ ★

Mr. Schaeffer was a native of New Britain, Conn., and a graduate of the Sheffield Scientific School, Yale University. He became identified with Farrel Foundry shortly after graduation and worked two years as an apprentice machinist and toolmaker.

William J. Palmer

William J. Palmer, sixty-six, who passed more than fifty years in the copper and brass industry, collapsed and died of a heart attack on August 30th in his office, 300 Park Ave., New York, where he was vice-president in charge of manufacturing for the **Phelps Dodge Copper Products Corp.**

★ ★ ★

Mr. Palmer had been with Phelps Dodge since 1937, first as works manager of the Bayway division, Elizabeth, N.J. He became a vice-president in 1952.

★ ★ ★

CHECK LIST FOR
PLYMKRAFT
IMPROVED CABLE FILLER
Samples supplied upon request
Made to fine tolerance
Always uniform
Available in put up that works best on user's equipment
Takes any type treatment—wax, jute saturant, anthracene
Made to user's specifications if desired
Backed by the Plymouth Cordage Company, makers of quality products since 1824
Write to: PLYMKRAFT DIVISION
Plymouth Cordage Company
Plymouth, Mass. • New Orleans, La.
Warwick, Va.
PLYMOUTH
1824

Starting at fourteen in the shops of the **Rome Brass & Copper Co.**, Rome, N.Y., he held executive positions with the **Revere Copper & Brass Co.**, at Rome; the **Chase Brass & Copper Co.**, Waterbury, Conn., and the **Bridgeport Brass Co.**, Bridgeport, Conn.

★ ★ ★

He was credited with many manufacturing improvements and developed the first continuous copper sheet rolling mill while with Revere.

Charles C. Wickwire

Charles C. Wickwire, president of **Wickwire Brothers, Inc.,** Cortland, N.Y., died suddenly on August 20th. Seventy-seven years old, he joined the firm, which was founded by his father, in 1898 and had served continuously as its president since 1914.

★ ★ ★

At the time of his death, Mr. Wickwire was a director and vice president of the First National Bank of Cortland; a director of The Brewer-Titchener Corporation; a director and former president of the Cortland Free Library; a member and former elder and trustee of the First Presbyterian Church; a director of the Cortland County Agricultural Society; a member of the Chamber of Commerce and the Rotary Club.

★ ★ ★

At one time, he was a director of the Auburn Theological Seminary; president of the Cortland Board of Public Works; a trustee of the YMCA and a director of Cortland Memorial Hospital. During World War I, he served as County Food Administrator.

★ ★ ★

Well-known for his acts of philanthropy, the Cortland industrialist donated a swiming pool to the city. With his brother, the late **Frederic B. Wickwire,** he gave a Maternity Wing and a Medical Wing to the city's hospital. An active conservationist, he furnished free trees to county 4-H Club members. He also made numerous contributions to the city's parks and library.

A Review of Recent Wire Patents

The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.

Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50¢ for each copy desired. For orders received from outside the United States the cost will be $1.00 per copy.

No. 2,757,505, PREFORMING HEAD FOR WIRE-STRANDING MACHINE, patented August 7, 1956 by Michael Vennett, New Haven, Conn., assignor to United States Steel Corporation, a corporation of New Jersey.

The structure includes a number of discs with circumferentially grooved forming rolls rotatably mounted on the discs between the central portion and bearing lugs of the discs. The rolls on the different discs forming groups around which a component of a stranded wire can pass for receiving a helical set.

★ ★ ★

No. 2,757,506, PREFORMING HEAD, patented August 7, 1956 by Eugene Beck, Antioch, and Carl T. Lanstrom, Concord, Calif., assignors to United States Steel Corporation, a corporation of New Jersey.

In this preforming head for wires, there are provided a number of inner rings spaced axially along an arbor, with an outer ring for each outer ring provided with circumferentially spaced bearing posts adapted to fit on the exterior of the inner ring, with a number of pins extending radially through each outer ring into the inner ring, and a preforming roller journalled on each pin.

★ ★ ★

No. 2,757,873, COIL WINDING MACHINE, patented August 7, 1956 by Kenly C. Bugg, Fort Wayne, Ind.

More specifically, the machine is for winding single layer wire coils on a toroidal core. Included is a devict for temporarily engaging a lateral face of the last wound turn of wire on the core for giving an intermittent rotational movement, in an arcuate coil seat, to the coil. There are twelve claims.

★ ★ ★

No. 2,758,629, APPARATUS FOR MANUFACTURING MULTIPLE WIRE STRANDED HELICAL SPRINGS, patented August 14, 1956 by Allen D. Lewis, Mantua, N. J.

This apparatus is of the type having an arbor rotatably driven between a headstock and tailstock and a carriage driven by a lead screw parallel to the axis of rotation of the arbor. A turret is pivotally mounted on the carriage for movement about an axis normal to and offset from the axis of the arbor, with a hollow spinner shaft journaled in the turret whereby the shaft may be adjusted about an axis collinear with the pitch line of a wire spring. Wires are fed to the hollow shaft to be stranded at a point of tangency with the rotating arbor.

No. 2,758,725, COIL HANDLING APPARATUS, patented August 14, 1956 by Leonard C. Collyer, Woonana, New South Wales, Australia, assignor to Steel Company of Canada, Limited, Hamilton, Ontario, Canada.

Included are a coil receiver in the form of a cradle having two walls disposed at right angles to each other mounted upon a drive shaft disposed at an angle of about forty-five degrees to the horizontal whereby the right angle between its walls is bisected by the prolongation of the axis of the shaft; a support ring disposed at right angles to the shaft and rigidly connecting the cradle to the ring.

★ ★ ★

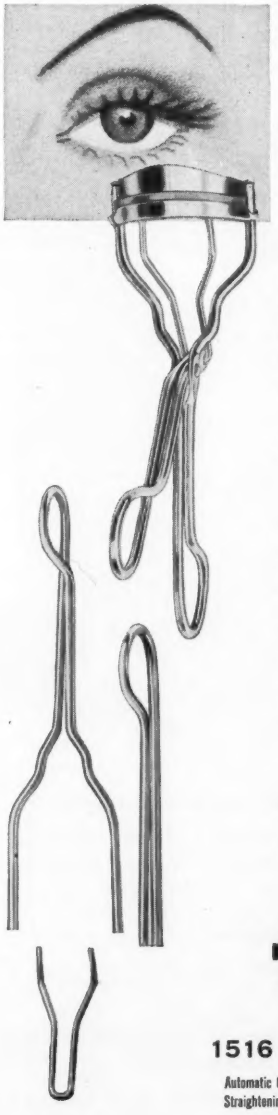
No. 2,759,389, SQUARE SHANKED, BARBED WIRE NAIL, patented August 21, 1956 by John C. Corckran, Baltimore, Md.

The transverse cross section of the shank is square and there is a uniform barbed surface on each of the four sides with the body of the barbs being inclined transversely to the nail axis on all four sides to produce a maximum periphery of the nail normal to its axis for any given cross-section shank area to increase the strength of the shank and to give minimum disturbance to the wood fibers cut and to hold them immediately upon cutting and continuously thereafter upon continued penetration of the nail.

★ ★ ★

No. 2,759,499, AUTOMATIC GRID MACHINE, patented August 21, 1956 by Stanley J. Gartner, Emporium, Pa., assignor to Sylvania Electric Products, Inc., a corporation of Massachusetts.

This machine is of the type having automatic means for helically winding



THIS WILL CURL YOUR EYELASHES

A Nilson #2 Four-Slide Automatic Wire Forming Machine is being used by Rollash Corporation, Brooklyn, N. Y., to form wire as shown for their eyelash curler . . . complete in one operation. After one year's operation they report savings of—

40% on actual manufacturing costs
15% on improved tooling which eliminates secondary operations.
10% on fewer rejects, full parts control assuring top precision.

. . . elimination of freight charges by making parts on premises . . . advantage of immediate access to production.

TOTAL SAVINGS . . . OVER 65%

NILSON 4-SLIDES FEATURE

- One-man operation
- Forming of wire or ribbon metal from coil
- One fast, automatic operation straightens, feeds, pierces, blanks, stamps or coins, cuts off, forms
- Critical tolerances up to .002" on any runs
- Fast tool and die changing
- Wide size range—forms wire up to ½" dia. in feeds to 32" max. Ribbon stock up to 3½" wide.
- Press sections 5 to 30 ton cap.
- Heavy duty models 50—75 ton cap.

Without obligation, Nilson provides specific forming recommendations from detailed information. Send for A. H. Nilson catalogs . . . the first step in increased production.

A.H. NILSON MACHINE COMPANY

1516 RAILROAD AVENUE, BRIDGEPORT 5, CONN.

Automatic Chain Making Machines • Staple Forming Machines • Wire and Stock Reels • Wire Straightening Equipment • Slide Feeds for Presses • Wire and Ribbon Stock Forming Machines

a grid lateral about a mandrel supporting a longitudinally advancing side rod and for securing a series of turns of the winding to the side rod leaving loose turns. The improvement comprises a loose turn remover having a blade cyclically reciprocated against the grid lateral wire to breach it by mechanical coaction between this blade, the side rod and the mandrel.

★ ★ ★

No. 2,759,606, MAGNETIC OIL CLEANER FOR SCREW MACHINE, patented August 21, 1956 by Paul W. Nippert, Columbus, Ohio, assignor to the Nippert Electric Products Company, Columbus, Ohio, a corporation of Ohio.

For separating metal particles from the coolant oil, a conveyor is provided with a flight having a magnetic surface extending into the oil for collecting the particles, and after collecting, they are removed from the flight.

★ ★ ★

No. 2,759,990, ELECTRICAL CONDUCTING ROPES, patented August 21, 1956 by Reginald Bean, Southampton, England, assignor to the Pirelli-General Cable Works Limited, London, England.

An extensible rope is provided comprising a central core of extensible insulating material, with an extensible winding of electrically-conducting wire mounted thereon and an extensible insulating sheathing of material over the winding, with an open braiding of textile material over the sheathing. A number of pairs of concentric load carrying stranded layers of textile material such as nylon are disposed over the braiding, with the layers of each of the pairs having the same number of strands and being laid on in opposite senses to give a balanced construction, strands of all of the pairs of layers having a constant angle of inclination to the rope axis.

★ ★ ★

No. 2,759,991, INSULATED ELECTRICAL CONDUCTORS, patented August 21, 1956 by Alfred Rheiner and Walter Dieterle, Basel, Switzerland, assignors to Sandoz A. G. Basel, Switzerland, a Swiss firm.

It is stated that the cable is particularly suitable for use as a weak-current cable, a high voltage cable and a high frequency transmission cable. It comprises a cable core consisting of at least one insulated wire conductor wherein the insulation comprises acetylated cellulose fibers, the structure of which has been maintained during the acetylation thereof, a multi-layered covering of thermoplastic material for this core, and at least one layer of hygroscopic material disposed between two layers of the thermoplastic covering.

★ ★ ★

No. 2,760,229, APPARATUS FOR APPLYING PLASTIC COATING TO WIRE, patented August 28, 1956 by Marvin C. Cheney, Hamden and Clarence I. McCall, Waterbury, Conn., assignors to the Lewis Engineering Company, Naugatuck, Conn., a corporation of Connecticut.

The patent contains eleven claims to a grooved rollers apparatus for forming and compacting under pressure cohesive particles of insulation into a substantially solid covering about a wire.

★ ★ ★

No. 2,760,570, APPARATUS FOR REMOVING SCRAP WIRE FROM SPOOLS, patented August 28, 1956 by Robert W. Reckhow, Kenmore, N. Y., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

More specifically, the apparatus is for cutting convolutions of strand material from a spool having a recess in one of its heads and a cutter receiving groove extending the full length of the strand supporting portion of the spool and also extending radially inwardly from the outer periphery of this portion.

★ ★ ★

No. 2,760,891, PROTECTIVE COATING AND METHOD OF APPLYING SAME TO METAL PARTS, patented August 28, 1956 by Vernon R. Nichols, Macon, Ill., assignor to Borg-Warner Corporation, Chicago, Ill., a corporation of Illinois.

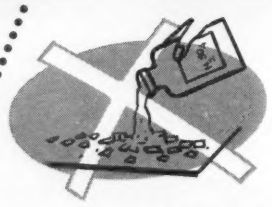
The method is applicable to brass, copper, zinc, steel, aluminum and cadmium surfaces and comprises immersing the parts in a protective coating solution consisting per liter of water of 150 to 600 grams chromic oxide, 85 to 170 grams of 66° Baume sulphuric acid, 43.4 to 130.2 grams of nitric acid (HNO_3), and not more than 22.5 grams of nickel sulphate hexahydrate ($NISO_4 6H_2O$) in an amount sufficient to retard eating action.

★ ★ ★

No. 2,760,892, MACHINES FOR THE MANUFACTURE OF MULTIPLE STRAND CONDUCTOR LEADS, pat-

STANNOUS SULFATE . .

A PREPARED chemical of UNIFORM quality for LIQUOR FINISHING



ELIMINATES haphazard preparation

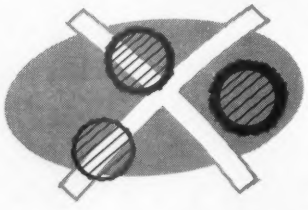
—Standard stock solutions are easily and quickly made up in advance . . . stannous sulfate composition is known, and is uniform from batch to batch.

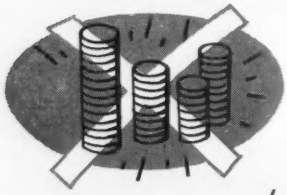
ELIMINATES complex control

—there are only two simple ingredients to control . . . color adjustment is quick and simple and may be made immediately.

ELIMINATES uneven quality

—tin content is divalent, the only form suited for iron replacement reaction . . . tin coatings are smooth and uniform, and of pre-determined thickness.





ELIMINATES unnecessary costs

—replaces needless processes, saves tin and copper, saves on time and labor, improves quality of tin coating.

Write for detailed information.

TIN & TIN CHEMICALS
CERAMIC MATERIALS
ORGANIC COATINGS
WELDING SUPPLIES
RADIOGRAPHIC EQUIPMENT
PLATING MATERIALS
METALS & ALLOYS
HEAVY MELTING SCRAP

"First Name in Tin Chemicals"

METAL & THERMIT CORPORATION

GENERAL OFFICES: RAHWAY, NEW JERSEY

ented August 28, 1956 by Faust R. Gonsett, Burbank, Calif.

A machine is disclosed for the manufacture of multiple strand conductor leads of the air insulated variety whereby the wires are connected to plastic elements by a partial fusing of the elements about the wires.

Introducing the Nailmaker

(*Continued from page* 1206)

10 times more than regular steel dies, but the life per redressing is 20 times as great! A carbide nail die can be dressed more times than regular steel dies, and at no greater expense.

★ ★ ★

Why is this longer life per dressing of the carbide so important?

★ ★ ★

It lowers the cost of labor per ton of nails produced. Less time is spent changing dies—time that can be more effectively used to keep more machines in operation. Of course, greater machine efficiency results.

Tool Life

The following is based on reports from Nailmaker installations:

Cutter life—25 to 35 million nails per redress
Grip dies—60 to 75 million nails per redress
Hammer—20 to 25 million nails per redress

Tool Maintenance

The operator of a battery of Nailmakers usually does not dress the tools. This is done in the tool room according to the uniform best method with the aid of jigs and fixtures. This signals the end of dressing tools by eye on an emery wheel according to a method by which each man dressed his tools his own way—frequently to the consternation of the operator on the following shift!

Conclusion

The above summarizes briefly this exciting new approach to nail making. The departure from the past is abrupt, but only in this way can the curtain be drawn on the old ways of the past and reopened upon the fresh new, more-profitable look of the future.

★ ★ ★

This, then, is the progressive outlook for modern nail making. The picture is bright—replete with all the profit-making advantages of higher speeds, lower maintenance costs, high operating efficiency, unprecedented tool life, fewer operating personnel and a preventive maintenance program. All this is practically expressed in the Nailmaker, an amazing, yet simple lifetime machine.

Plasticizers for the Wire and Cable Industry

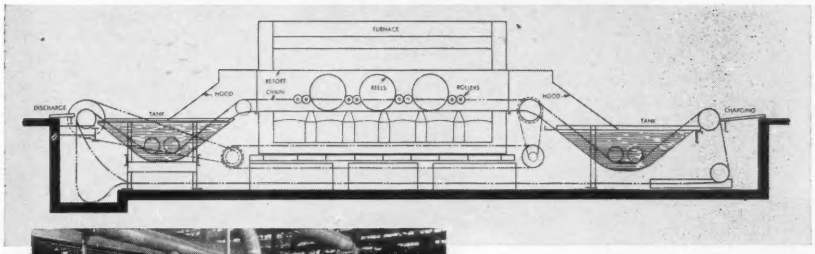
(*Continued from page* 1216)

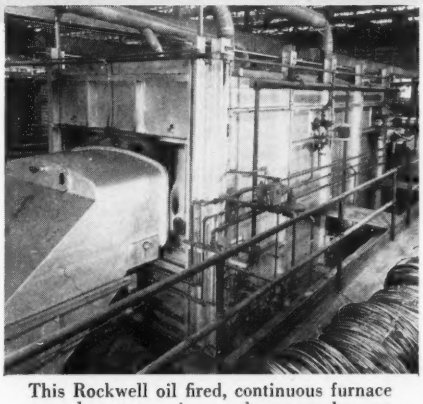
tically every organization doing work in the field. At least we have a bench mark, a specific point of data and evidences of a reasonably reliable test procedure—a beginning for the development of a true electrical specification for plasticizers.

★ ★ ★

As for specific products, it is my opinion that the decyl phthalate has been geared to the vinyl insulation requirement more nearly than

Bright Anneals Copper Wire at Lowest Cost





This Rockwell oil fired, continuous furnace anneals copper wire on drums at the rate of 120,000 lbs. per 24 hrs. Drums travel 4 abreast. The work is carried through the exit hood, in foreground, into a steel water tank for quenching, without exposure.

The "wet" method of annealing copper wire (to be subsequently rubber covered), is a Rockwell development that has proved very efficient in operational simplicity, production quality, and labor and space saving.

Drums of coiled wire move continuously, from the wash or other process through a wet or dry seal, then through the alloy retort of the furnace, exit hood, water quench and discharge.

The reels or drums of wire travel several abreast, being rolled along the tanks and retort floor by pipe rollers attached to the alloy link chain conveyor. Length of processing system depends on production needs.

The furnace may be gas or oil fired, or electric. Annealing atmosphere may be provided to assure desired brightness of metal.

It will pay you to learn more about this and other types of Rockwell wire heating equipment. Get Bulletin 432.

ROCKWELL ALSO BUILDS
Batch and continuous furnaces and ovens for annealing, aging, drying, enameling, tinning, glass coating, synthetic coating. Atmosphere generators.

ROCKWELL SINCE 1888 BUILT

W. S. ROCKWELL COMPANY
FURNACES • OVENS • BURNERS • VALVES • SPECIAL MACHINERY
2426 ELIOT STREET • FAIRFIELD, CONN.
Sales Representatives in Principal Cities

any other single plasticizer of importance. To date, the usefulness of the product in insulation has been recognized and supported with much detailed technical data including performance characteristics on insulated wire . . . data supplied by the plasticizer manufacturer. Other products will certainly follow—specifically designed for the vinyl insulation end use.

★ ★ ★

On the other side of the fence is the using industry . . . a sampling of opinion confirms the fact that low cost of the plasticizer component is an important factor in this highly competitive industry. On other than electrical properties, the most frequent complaint is the lack of uniformity of the product from batch to batch. This complaint is not predicated of plasticizers alone but actually embraces practically all the constituents of the vinyl formulation.

In effect, the litany of desirable features leads one to believe that if one could select all the good features of the phthalates, phosphates, polymerics and low temperature plasticizers—build these into one single compound to sell at the extender price at a specific gravity of less than one—we would indeed have achieved an ideal.

★ ★ ★

On electricals, the answer can be reduced to a problem of matching the insulation resistance of the vinyl resin itself. But again, uniformity of product comes into the picture. How often have you heard or felt that a uniformly satisfactory plasticizer was of more value than one that performed excellently in one instance and not-so-good in the next.

★ ★ ★

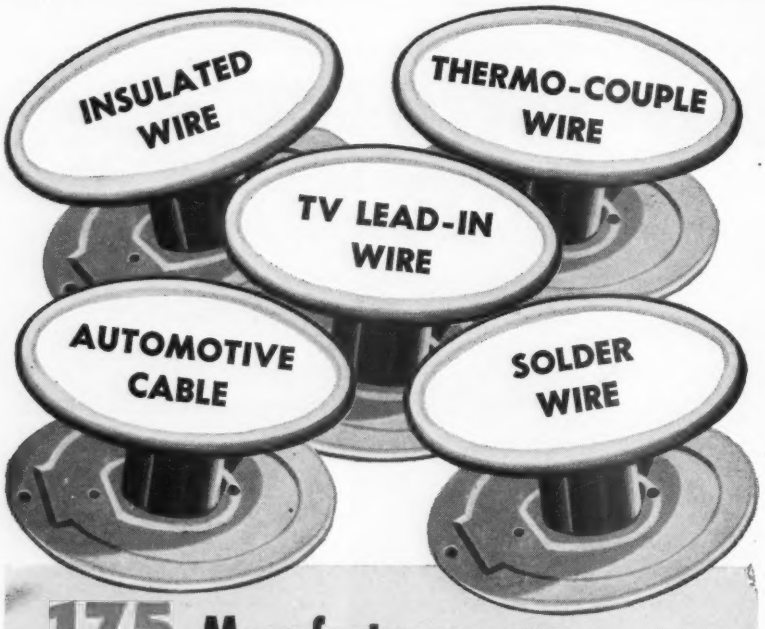
With regard to the development of a specific meaningful point of data to insure uniformity of electricals, opinion generally conceded that volume resistivity values were the most useful single element of electrical data for screening purposes. In each case, it was pointed out that the value of the volume resistivity data depended upon the correlation of such values with the actual insulation resistance of the wire or with other test data used in the individual firm's own laboratories.

★ ★ ★

Thus, I submit that we might well achieve some basic specification for plasticizers in the vinyl insulation field by the definition of a specific plasticized slab formula and test procedure . . . using volume resistivity values to initially constitute the electrical specification for each plasticizer. Arriving at such a uniform concept would afford both the plasticizer industry and the vinyl insulation field a common ground for mutual understanding.

★ ★ ★

A final word, should we arrive at such a happy circumstance—you can be assured that the plasticizer industry will still constantly be striving to achieve the ideal product or products to satisfy the



175 Manufacturers say MASON Spools are best—for less!

These manufacturers specify Mason lightweight, non-returnable, lithographed Spools for performance, appearance and cost!

And while Mason Spool performance speaks for itself, the appearance of Mason Spools speaks for *you* with rich, colorful lithography that assures *instant brand recognition.*

Mason lightweight, non-returnable Spools are available in 5″, 6½″, 8½″ and 10½″ head sizes. All sizes are available with 1⅛″ (Dia.) barrels. The 10½″ head size is also available with a 3½″ (Dia.) barrel. Barrel lengths from ⅝″ to 14″.

Let us know about your spool requirements *now!* Telephone East Providence 1-2810 or write to the address below.

MASON CAN COMPANY

1949 Dexter Road, E. Providence 14, R. I.
Branch Plant — Greenville, Ohio

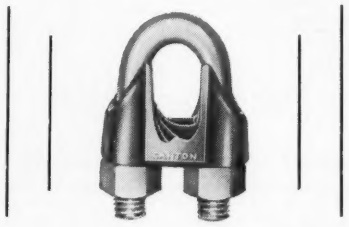
exacting demands of the wire industry.

Reference

1. "Measurement of Volume Resistivity of Plasticized Polyvinyl Chloride," C. E. Balmer and R. F. Conyne, Rohm & Haas Co., Philadelphia, Pa.
2. Bulletin S-07-179 EG, Celluflex 179-EG (Tricresyl Phosphate) Celanese Corporation of America, New York, N. Y.

New Clips for Wire Rope

Canton Manufacturing Co., specialists in holding and binding products, have added Wire Rope Clips to their line and will sell them under the name "Canton". A complete range of sizes are available for wire rope diameters from 1/8" up to 1 1/2", 16 sizes in all. They are offered in (1) Plain self-colored finish, (2) Cadmium plated or (3) Hot Dip Galvanized. The



U-Bolt portion is heavy steel with malleable saddle shaped to fit wire rope strands giving maximum grip.

★ ★ ★

For additional information, write: Canton Mfg. Co., 2408 13th St. N. E., Canton 5, Ohio.

New Fastener Catalog

The Sterling Bolt Co., 4648 W. Lake St., Chicago 44, announces publication of a new edition of their fully illlustrated fastener catalog, marking the fifth revision since 1946.

★ ★ ★

This single volume contains purchasing data for one of the world's widest variety of bolts, nuts, screws, washers and miscellaneous metal fasteners. In addition, extensive listing of standards, weights, design and other information of interest to the metal fastener buyer have been included.

G. E. Issues Silicone Rubber Selector

A "lightning selector" to facilitate a rapid, accurate choice of a proper silicone compound has been prepared by the Silicone Products Department of the **General Electric Co.**

★ ★ ★

Designated AD 24 E, the selector lists the major categories of silicone compounds and typical properties of each. Cross references to AMS and ASTM specifications are also included.

★ ★ ★

A more detailed description of

NORBIDE* Abrasive Grain...

Ready to cut Your Refinishing Costs!

Wire men who have switched from costly diamond dust to NORBIDE Abrasive for refinishing dies are amazed at the savings. They have found NORBIDE Abrasive — the hardest manufactured abrasive commercially available—ideal for ripping and semi-finishing operations. Whatever your requirements, we can supply you promptly from stock.

For details and prices on this cost-cutting abrasive, write for form 559, NORTON COMPANY, 45 New Bond St., Worcester 6, Mass.

NORTON®
BORON CARBIDE
Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories.
BEHR-MANNING PRODUCTS: Coated Abrasives Sharpening Stones • Behr-cat Tapes
*Trade-Marks Reg. U.S. Pat. Off. and Foreign Countries

NORBIDE* | *The hardest manufactured abrasive commercially available!*

COLBOURNE MACHINE CO.

MANUFACTURERS OF

MAGNET WIRE MACHINERY

FOR FINE WIRE

WINSTED, CONNECTICUT

TAKE-UPS *FINE WIRE* PAY-OFFS

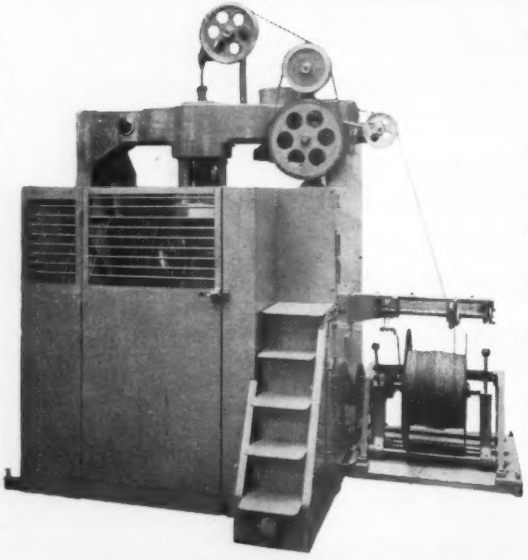
GAS FIRED ENAMELING OVENS

RE-SPOOLING & WINDING MACHINES

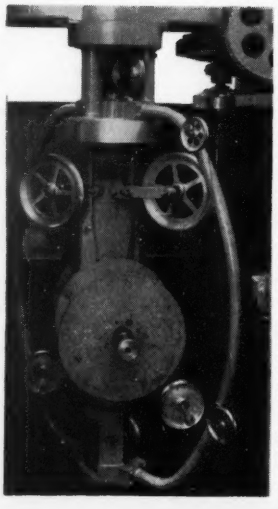
TEL.: FRONTIER 9-6554

21 MUNRO STREET • WINSTED, CONN.

SAME FRAME AS THE QUADDER ... HIGH SPEED TWINNER



- Specially built for plastic telephone cables, each wire insulated with strong or cellular polyethylene down to 26 Awg.
- Let-off drums up to 22".
- Production: 1000 lays per minute.
- Fully compensated and balanced wire tension.
- Right and left hand lays 1 to 7".
- Single or double take-up (maximum 30").
- Centralized lubrication.
- Lockheed brake.
- 10 Machines already running in the United States.



POURTIER MACHINES 153, rue Général Galliéni ROMAINVILLE (Seine) FRANCE

silicone rubber and its applications is contained in the 24-page publication, "Imagineering with Silicone Rubber," also obtainable by writing the department at Waterford, N. Y.

STATEMENT OF THE OWNERSHIP, management, and circulation required by the Act of Congress of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (Title 39, United States Code, Section 233), of WIRE AND WIRE PRODUCTS, published monthly at Jersey City, New Jersey, for year, 1956.

1. The names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Richard E. Brown, 453 Main Street, Stamford, Conn.; editor, Edmund D. Sickels, 453 Main Street, Stamford, Conn.; managing editor, none; general manager, Ruth S. Spengel, 453 Main Street, Stamford, Conn.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.) Quinn-Brown Publishing Corporation, 453 Main Street, Stamford, Conn.; Richard E. Brown, 453 Main Street, Stamford, Conn.; Leta B. Brown, 1045 Summit Road, Montecito, Cal.; Ruth S. Spengel, 453 Main Street, Stamford, Conn.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required from daily, weekly, semiweekly, and triweekly newspapers only.)

RUTH S. SPENGEL
Treas. & General Manager

Sworn to and subscribed before me this 18th day of September, 1956.

HAZEL R. RANDLETT
Notary Public
My commission expires April 1, 1'58

Folder on VPI Papers

The Orchard Paper Co., St. Louis 15, Mo., has issued a folder entitled "Orchard VPI Rust Preventive Papers," in which besides describing the full line of laboratory developed papers, complete information is given on metal preparation for shipping, methods of packaging, handling, factors influencing protection and the differences between in-plant protection, shipping protection, etc.

★ ★ ★

Complete data is provided on the eighteen grades of VPI papers made by the company, with indications as to their appropriate applications.

★ ★ ★

Full information on these corrosion inhibiting papers may be secured from the company.

★ ★ ★

To Represent Torrington in New England and New York

Kenneth E. O'Shaughnessy has been appointed factory sales representative, New England and Central New York States, by **The Torrington Mfg. Co.**, Torrington, Conn.

Silicone Insulated Conductors

(*Continued from page* 1220)

References

1. **Test Procedure for Evaluation of Systems of Insulating Materials for Random-Wound Electric Machinery, AIEE Standard No. 510 (Formerly AIEE No. 1C).**
2. **Silicone Rubber as Cable Insulation by J. F. Dexter and P. C. Servais, presented at the U. S. Army Signal Corps Wire and Cable Symposium, December, 1953.**
3. **Use of Silicones in Shipboard Cables by G. Michael Van Lear, presented at the U. S. Army Signal Corps Wire and Cable Symposium, December, 1953.**

How to cut your wire handling time 4 TIMES or more...

Use Sheffield Manufacturer's Wire in the new

Sheffield KONE-PAK

Goodbye to the old method of packing small 100 to 2000 separate coils of wire in a carload! Sheffield puts the same amount in just 50 KONE-PAKS. And your unloading costs go down.

You'll save by having fewer units of wire to handle. Faster set-up for threading into machines. Fewer loadings. Less down time for changeovers. Scrap-ends loss reduced around 75%. Big cuts in labor costs. Wire snags reduced to a minimum.

For still more economy: Ask for the help of our metallurgists and wire specialists to be sure you get the exactly-right wire for your needs. Call your nearest Sheffield office.

Now! Rust-Protected

Every shipment of Sheffield Manufacturer's Wire is protected with special paper or pellets that release a rust- and corrosion-resistant vapor.

SHEFFIELD STEEL
DIVISION
ARMCO STEEL CORPORATION
SHEFFIELD PLANTS: HOUSTON • KANSAS CITY • TULSA

THE NELSON COMPANY

STANDARD OIL BUILDING
BALTIMORE 2, MARYLAND

REELS!

WOOD • PLYWOOD • MASONITE

10" to 120" IN DIAMETER

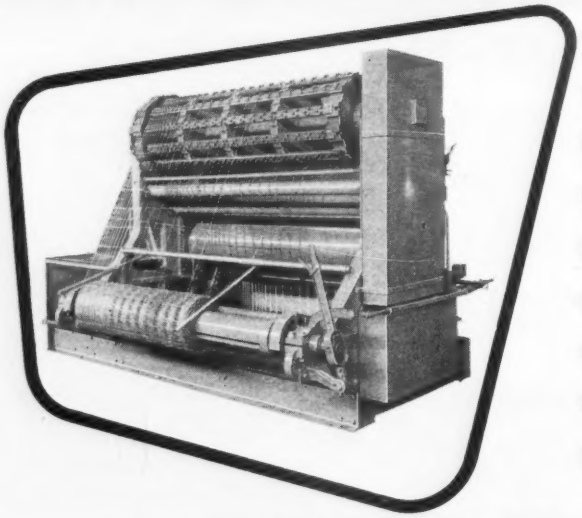
SET-UP OR KNOCKED DOWN

QUICK DELIVERIES

SPECIALIZING IN WIRE ROPE REELS AND INEXPENSIVE "ONE-TRIP" REELS FOR CABLE

THIRTY YEARS OF EXPERIENCE IN QUALITY WOODWORKING

Interlocking FENCE LOOMS



- Fastest — Most Efficient
- Preferred by Leading Mills
- Low Maintenance Cost
- Wrapped Stay Fence
- Straight Stay Wires
- Integrated — Space Saving
- Replaceable Main Bearings
- Single or Double Strands
- Years of Low Cost Production

Write for Detailed Information — Without Obligation

Interlocking Fence Co., Box 8, Morton, Ill.

Specialists In Fence Looms

New Teflon Extrudable in Standard Machines

A new plastics material called "Teflon" 100-X perfluorocarbon resin has been developed by **Du Pont's Polychemicals Department.** It is being evaluated as a supplement to the present line of "Teflon" tetrafluoroethylene resins that are finding applications in such fields as high temperature electrical insulation, chemical-resistant hose, etc. However, it may not be in commercial production until 1959.

★ ★ ★

The new resin approaches the unique heat and chemical resistance of conventional "Teflon" but has a melt viscosity low enough to permit extrusion in standard equipment. Conventional "Teflon," because of its high melt viscosity, requires special equipment and techniques for extrusion.

★ ★ ★

The generic term — "perfluorocarbon" — has been adopted for "Teflon" 100-X to distinguish it from conventional "Teflon," from which it differs somewhat in composition.

Fenn Opens Metallurgical Laboratory

The opening of Fenn's new, modern metallurgical laboratory was announced in September by **James I. McMartin,** Director of Engineering, **Fenn Manufacturing Co.** of Newington, Conn. The laboratory enables Fenn to maintain full control over the physical and chemical qualities of all raw materials purchased and provide its customers with a thorough metallurgical analysis of any metal under consideration for processing on Fenn metal forming equipment.

★ ★ ★

Under the supervision of **Robert Turnbull,** Chief Metallurgist, the laboratory offers heat treatment analysis of metal, determinations of the machinability of any metal and changes in grain structure due to the rolling and swaging processes.

Warren Wire Opening West Coast Plant

Warren Wire Company is opening a branch manufacturing plant in Alhambra, Cal., it was announced by **John R. Cook,** president. The new wire mill will manufacture aircraft and missile cables. Employment in this operation should approach 100 by the end of the first year. Products manufactured will be a duplicate of its Eastern aircraft cable plant, located at Pownal Center, Vt.

★ ★ ★

In addition, a further expansion of its Eastern operation is planned. The new equipment, now being installed, will be used to produce a new very high temperature cable used behind the fire wall in the new jet aircraft. It is expected that an additional 100 people will be employed in Pownal within the next six months. A new building of 10,000 square feet is approximately one-half completed.

NESOR ALLOY PRODUCTS CO.

MANUFACTURERS OF WIRE • STRIP • BRAID • STRAND

282 HALSEY STREET NEWARK, N. J.

FINE WIRE

TO .001

IN THE FOLLOWING METALS AND ALLOYS

ALUMINUM- AND ALLOYS
BARE AND TINNED COPPER
LEAD AND SOLDER ALLOYS
PRECIOUS METALS
MONEL-NICKEL
STAINLESS STEEL
STEEL-LOW AND HIGH CARBON
RESISTANCE WIRE
COPPERCOATED STEEL
SILVER PLATED COPPER
BRASS AND ALLOYS
PHOSPHOR BRONZE

Exacting size tolerances—uniformity of tempers, a good product and prompt service. A dependable supplier soliciting your business.

Consultation—Samples and Quotations Without Obligation.

GARFIELD WIRE DIVISION

of The Overlakes Corporation

FINE WIRE SPECIALISTS

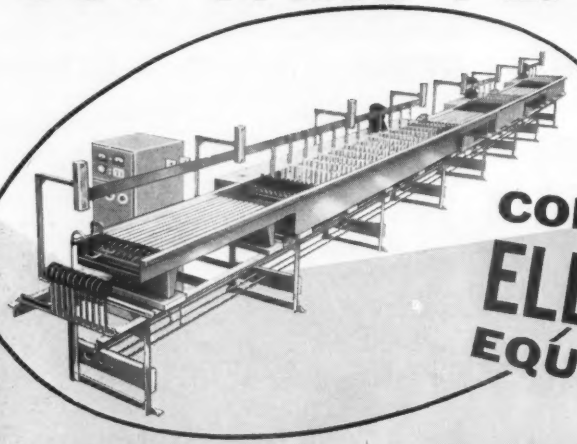
Fabricators of Precision Drawn Copper Wire Conductors in Accordance with ASTM Standards and MIL Specifications.

- **BARE COPPER WIRE**
- **TINNED COPPER WIRE**
- **ENAMELED COPPER WIRE**
- **BUNCHED and STRANDED COPPER WIRE**

142 MONROE STREET • **GARFIELD, NEW JERSEY**

CUT WIRE PLATING COST!

maintain uniformity on copper and aluminum wire



CONTINUOUS U.I.E.C. ELECTROPLATING EQUIPMENT

This low cost equipment performs uniform high quality work at speeds that mean real savings. Simple to operate. We furnish complete installation.

Write today to:

UNIVERSAL INDUSTRIAL EQUIPMENT CO.

SECAUCUS, NEW JERSEY

Sole agent in Canada: E. V. LARSON CO., LTD., TORONTO, CANADA

Continuous Production Electroplating of Tin on Copper Wire Using Alkaline Potassium Stannate Bath

(*Continued from page* 1204)

can be made quickly. A foaming agent such as potassium oleate may be used to maintain a foam blanket over the solution and reduce evaporation.

★ ★ ★

A loose coating of tin will be plated on the wire if stannous tin is allowed to form in the bath. This condition occurs when the tin anodes are operated at an incorrect current density. 18 to 20 amperes is normal for a "High-Speed" anode 2-½ inches in diameter and 6 inches long. When operating correctly, the anode surface is a yellowish-brown color. White and black anode colors indicate too low and too high current densities respectively. A large formation of stannous tin in the bath is indicated by a dark color, but small amounts are immediately detected by dipping a test paper into the solution. The stannous tin is reverted back to stannate by oxidizing with hydrogen peroxide. At the same time, the cause of the stannous tin formation should be located and corrected. A few causes could be (1) incorrect number of anodes, (2) short circuit in the system, or (3) poor contact of anode to bar.

★ ★ ★

Another condition which interferes with proper plating is a large accumulation of sludge. Normal amounts, however, are not harmful due to the high tolerance of the alkaline bath for impurities. Tin salts are subject to hydrolysis and precipitation of basic insoluble tin compounds. This occurs when the solution is heated too rapidly, or when the solution is out of balance, which condition is bound to occur occasionally when the machine is used 24 hours a day on a production set-up. In order to reduce sludge formation, the Federal Wire and Cable Company uses a heating coil temperature not higher than 280°F and continuously recirculates the solution even while heating. The use of soft water in the solution has also proven to be helpful. After 3000 hours of operation, it is advisable to remove the solution from the plating tanks. After the sludge has settled out, the remaining solution is returned to the tanks and potassium stannate and potassium hydroxide are added to bring the bath back to normal.

★ ★ ★

Plating solution may also be lost as a result of drag-out on the wire. This can be minimized by keeping the seals reasonably tight at the ends of the tanks and also by the addition of wipers just outside the tanks. It is impossible to completely eliminate losses through drag-out and sludge formation. Losses are approximately 4 pounds of potassium stannate per 1000 pounds of plated wire. Proper control of the potassium hydroxide concentration in the solution is important to minimize sludge formation.

★ ★ ★

Rinsing and Drying — Precautions should be taken to thoroughly rinse and completely dry the

James L. Entwistle

ANNOUNCES —

TWO MORE REVOLUTIONARY WIRE MACHINES...

In addition to our Spark Tester and Recorder, Class J, introduced in the September issue of "Wire and Wire Products," we now offer our

AUTOMATIC RE-SPARKER

for re-reeling, measuring, and spark testing defective reels of wire from an insulating operation.

This machine combines the Spark Tester and Recorder in an integral unit with automatic speed and fault location controls, power lift of reels, and ball bearing screw traverse.

Precision speed control, braking, and automatic reversing are accomplished without the use of direct current motors.

Patching press and controls can be furnished if desired.

See "Wire and Wire Products" November issue for complete details on this machine, as well as on our new

INTEGRAL SPARK TESTER AND AUTOMATIC DOUBLE HEAD COILER

NOTE: If you would like us to send you complete information on these machines immediately, just write or phone us. Detailed specifications, prices, over-all dimensions, and other pertinent data are available now.

James L. Entwistle Co.

INTERNATIONAL BUSINESS COORDINATORS JLE

CONSULTING ENGINEERS • MACHINE DESIGNERS
761 PARK AVENUE • CRANSTON 10, R. I., U.S.A.

London • Paris • Cable "Jalenco" Providence

Telephone STUART 1-5656

wire prior to spooling.

★ ★ ★

Line Interference — Interference between wire lines indicates that the lines are not properly insulated. This condition can occur if the machine becomes dirty and leakage currents track across the insulators. The effect is most pronounced when one wire line is using high current as required for heavy plating thicknesses which are used for redrawing. Normally, however, interference between lines is negligible.

The fundamental requirement for successful production plating is good housekeeping. This means that the machine must be kept clean and clearance should be provided on all sides to facilitate cleaning and maintenance of equipment. Once the wire lines are set up and running, there is ample time for the operator to wipe off all insulators. The anode bars should also be wiped frequently in order to ensure good contact of the anodes. Although there is no harmful evaporation from the solutions, it is well worth-while to install an exhaust system over the machine. While the foam blanket over the bath minimizes the spray, a small amount of steam and caustic does vaporize, condense, and form a residue over the insulators. This caustic residue when dry is itself a good insulator, but when it becomes moist during very humid weather, it becomes a good conductor and can produce undesirable results.

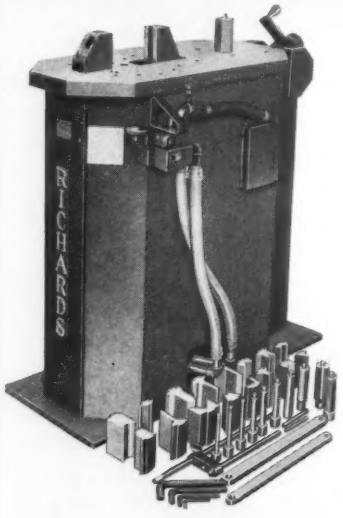
★ ★ ★

There are some limitations of electroplating, but none of them are serious. Compared to the bright finish of dip tinned copper, the electro-deposited tin produces a dull, matte finish. For low values of thickness, trouble will be encountered if soldering is attempted without a flux, particularly after shelf aging. To overcome this, a heavier coating is deposited when the flux is to be omitted on soldering. Although it has not been found necessary, the dull finish can be brightened by heat flowing. One method is to pass the tinned wire through a die which is 2 to 3 ten thousandths of an inch smaller in diameter than the wire. This small reduction polishes the tin without hardening the wire. In view of manufacturing tolerance of the bare wire, this method requires a large stock of dies. A second method is to apply direct heat to the wire by means of a flame burner. In this case, the flame must be very hot in order to reflow the tin while the wire passes through. When the wire is stopped, the flame must be quickly removed to prevent the wire being burned off. A third method is the use of induction heating, but in this case the capital expenditure is very high. In all cases, the brightening operation would be performed between the final rinsing section and the take-up. This process of brightening would be difficult on a production system unless induction heating were used.

★ ★ ★

A second limitation of the subject installation is that the maximum wire speed is determined, not by plating capacity, but by cleaning capacity. This, however,

MULTIFORM BENDERS



Big Brother B Model

¼" x 4" Capacity
Air Operated

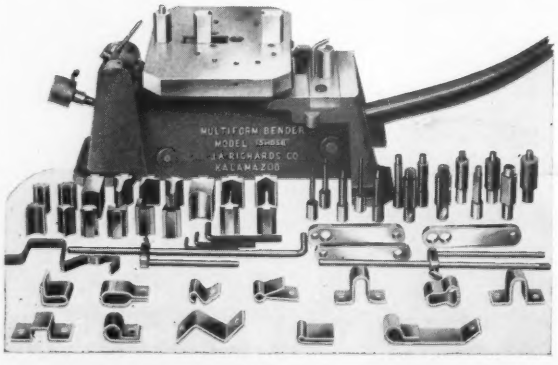
Eliminate Special Tooling Cost
Reduce Set Up Time
Boost Production

IF

Fabrication is a Problem Solve it with a Multiform.

Wire Forms - Bus Bars - Brackets - Stampings - Springs Steel Rule Dies etc.

J. A. RICHARDS COMPANY
KALAMAZOO, MICHIGAN



Write today for literature

Hand and Air Models

At left is the No. 5HDSB MULTIFORM BENDER CUTTER. Capacity ⅛" x 1½".

could easily be remedied in any future installation. It is a serious mistake to overlook the essential need for thorough cleaning. Both mechanical and electrical methods should be used. The adherence of the tin coating is proportional to the completeness of cleaning.

★ ★ ★

A third feature may be considered a disadvantage when directly compared to a hot dip plating system. The hot dip plating will adhere equally well to either hard or annealed wire. However, from experience with electroplating, it appears that a tightly adhering coatting is more easily applied to hard and medium hard wire than to soft wire, although all types may be electrotinned satisfactorily.

★ ★ ★

The advantages of electroplating with the potassium stannate alkaline bath are numerous:

(1) Lower production costs. Savings are achieved in both material and labor.

(2) Uniformity of product. Uniform coating is obtained over the entire surface of the wire and its thickness, in millionths of an inch, is easily measured by means of an electronic thickness tester.

(3) Higher wire speeds and versatility. Special "High-Speed" anodes permit high speed plating without causing unbalance in the bath. Because of the design of the electrical circuit, complete flexibility of sizes of wire and different thicknesses of coating can be produced. Different sizes of wire and different thicknesses of tin may be plated simultaneously.

(4) Uniformly annealed tinned fine wire is obtained by continuous resistance annealing following redrawing.

(5) Increased productivity per unit of floor space. Capacity is increased 50 per cent in the same area. 10 per cent of the space required is secondary, being used for rectifiers and motor generator sets.

(6) Simplicity of operation. Both setup of the wire and control of the bath are simple. Placement of the anodes is not critical due to the excellent throwing power of the solution.

(7) Use of standard materials in machine design. Ordinary mild steel tanks are used and linings are unnecessary. All piping and auxiliaries are standard materials.

★ ★ ★

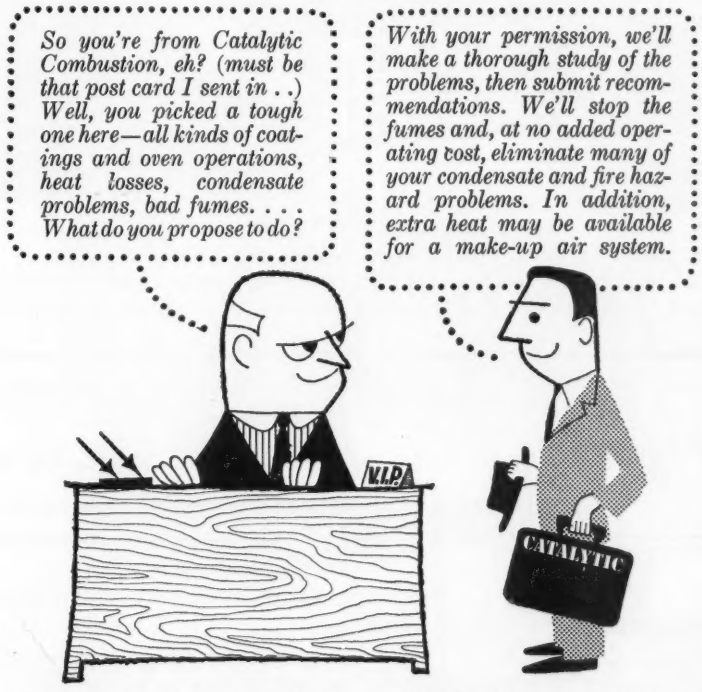
Although this system has the above advantages over hot dip plating, there is still scope for improvement. Further material savings might be possible and wire speeds could be increased further with additional cleaning. Development of a practicable polishing method would permit use of thinner deposits, due to the higher resistance to shelf aging of brightened surfaces.

★ ★ ★

After two years of continuous operation, the electroplating system at the Federal Wire and Cable Company, using the potassium stannate bath and "High-Speed" tin anodes, has been very successful.

Quality Control Symposium Scheduled

The Third National Symposium on Reliability & Quality Control in Electronics will be held January 14, 15 and 16th, 1957 at the Hotel Statler, Washington, D. C. The theme will again be a "Report to the Nation on the Present Status of Reliability." There will be two concurrent Sessions for four periods during the day. Evening sessions, movies, plant tours and panel discussions as well as a banquet will be on the schedule. For further information contact **R. G. Murrell,** Melpar, Inc., Falls Church, Va.


So you're from Catalytic Combustion, eh? (must be that post card I sent in . .) Well, you picked a tough one here—all kinds of coatings and oven operations, heat losses, condensate problems, bad fumes. . . . What do you propose to do?
With your permission, we'll make a thorough study of the problems, then submit recommendations. We'll stop the fumes and, at no added operating cost, eliminate many of your condensate and fire hazard problems. In addition, extra heat may be available for a make-up air system.
V.I.P.
CATALYTIC

V.I.P.: Won't this be expensive?

MR. CATALYTIC: No, sir. The survey is on us, and the results are intended to save you money. Frequently with heat recovery, the cost of a unit is amortized within one year, not to mention time saved through increased efficiency.

V.I.P.: I'd like to get my oven builder's comments on this.

MR. CATALYTIC: By all means. . . . Since we do not build ovens ourselves, we are working with leading manufacturers to adapt Catalytic Systems to both existing equipment and new designs. We'll work with you or your oven builder, as you prefer.

V.I.P.: Hmm, sounds good. Let's start that free survey you were talking about.

CATALYTIC COMBUSTION CORPORATION

4545 Grand River Avenue, Detroit 8, Michigan

Representatives in all Industrial Areas

Automotive Zigzag Spring Wire

(*Continued from page* 1186)

spring-back in the wire after wrapping it several times around a mandrel. This test, commonly known as the "Pigtail Test," is used by the fabricator to predetermine the physical reaction of each coil to the corrugating and forming operations. In actual operation, the test is performed as follows: A sample end is placed in a winding device and wound eight times around a .875″ diameter mandrel. The load is released and the test specimen is removed from the winding device. The "Pigtail" is then placed in a jig and the set or spring-back is measured on a template. Templates made up for each size of wire are calibrated in ranges. Figure #4 shows the equipment used in "Pigtail Testing."

★ ★ ★

By using the test described above, the fabricator can group coils of wire into grades according to their "Pigtail Value." The more difficult corrugation jobs will require certain grades of wire, while others may be produced from all grades. A direct relationship exists between the tensile strength and the "Pigtail Value" of finished wire. Results shown in Figure #5

Fig. 4—The "Pigtail Test." * * * * *

were obtained from hundreds of routine tests made during the inspection of 12 ga. wire. Zigzag corrugator production can be increased by stocking machines according to grades, thus eliminating or minimizing machine adjusting and scrap loss.

★ ★ ★

When the inspectors are satisfied that the wire meets all requirements of the quality standards established for this product, it is released for bundling or packaging. The wire may be bundled in almost any manner desired by the consumer. At the present time, all sizes of Automotive Zigzag Spring Wire are being bundled in approximately 300# coils on an automatic power steel-strapping machine. Shipping tags show the following information: gage, type of wire, consumer's specification number and purchase order number, heat number, starting end of the bundle, and date of manufacture.

★ ★ ★

problem:

- are you having difficulty meeting high temperature wire insulation specifications?
- do you have trouble meeting abrasion and friction requirements?
- can you meet oil or moisture-resistance standards?

solution:

CHEMO'S TEFLON* COATED GLASS YARN provides:

- insulation for continuous operation at temperatures up to 500°F with intermittent service up to 620°F.
- excellent abrasion resistance and low coefficient of friction.
- chemical inertness and zero moisture absorption.

Chemo has the answer!

* registered trademark of the DuPont Company for its tetrafluorethylene resin.

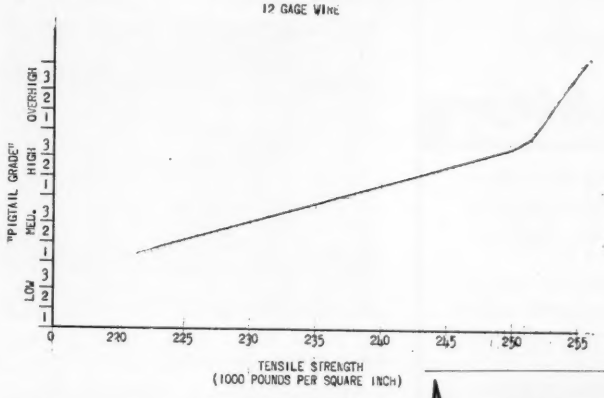
chemo TEXTILES, INC.

one of the leading suppliers of Teflon* to the wire industry!

WEST WARWICK, RHODE ISLAND — PHONE VALLEY 1-4121

New York Office: 1071 6th Avenue—Phone Longacre 4-2900

FIGURE #5
"PIGTAIL GRADE VS. TENSILE STRENGTH
12 GAGE WIRE



After bundling, the wire is placed on racks or pallets and moved into the storage area to await shipment. The wire is loaded in railroad cars or trucks from the pallets. During the bundling, storage, and shipping operations, it is necessary to exercise every precaution to protect the wire so that it will arrive in the consumer's plant in good condition. Undesirable corrosion or rusting of the wire may result from exposure to moisture, acid fumes, or other chemicals. Improper handling may cause other damage such as loose strands, tangled strands, or distortion of coils.

★ ★ ★

Automative Zigzag Spring Wire is a specialized type of wire developed and produced for the specific requirements of the automotive industry. It is a high quality product and rigid controls must be exercised over manufacturing practices in order to maintain the necessary uniformity and other quality standards.

New Catalog on Carbide Tools

Aluminum Oxide cutting metals, tool tips, throw-away inserts, cylinders and other machine turning and cutting tools are described in a new 12-page Catalog No. D-56, published by **The Metal Carbides Corp.,** Youngstown, Ohio. The catalog includes technical data on aluminum oxide, recommended applications and machining practices, dimensions of standard tools and instructions for grinding them.

Drawing Quality Aluminum Wire

(*Continued from page* 1198)

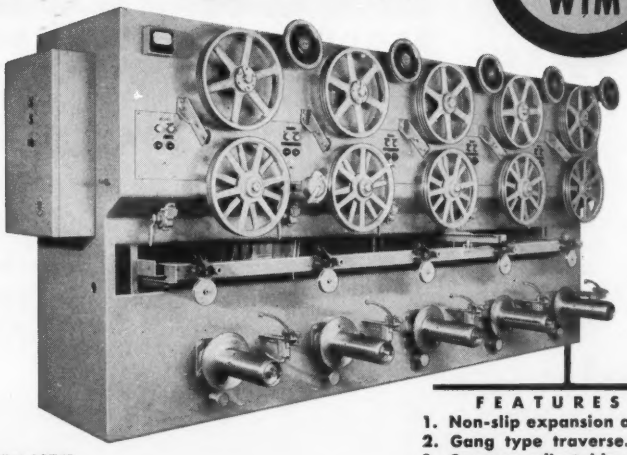
temperatures can be used to vaporize completely the oil during annealing provided heat-treatable alloys are slowly cooled from annealing temperature.

★ ★ ★

Once a drawing machine is strung up, axial entry of the wire to all dies should be assured. Axial entry, as illustrated in Figure 4,

. . . for the BEST in TINNING TAKE-UPS

THINK OF WIM



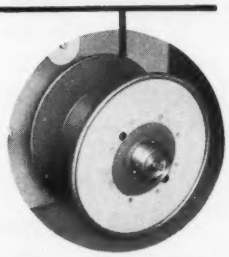
WIM-1075B

HEAVY DUTY

TINNING TAKE-UP

Here is a tinning take-up designed to do the heavier jobs. The WIM-1075-B with increased take-up speed (150 to 750 feet per minute) and positive independent tension control will speed up production and minimize down time. This unit will handle spools up to 22" in diameter and 12" wide with a maximum of 550 lbs. of wire. Special design feature includes the use of a 5" 3 jaw expansion arbor which absolutely prevents reel from sliding off the arbor. Optional features include full reel and broken wire run out switches, and pneumatic full reel ejectors. This machine with an all steel welded construction and anti-friction bearings throughout will give long lasting dependable performance. Write for complete details.

FEATURES
1. Non-slip expansion arbor.
2. Gang type traverse.
3. Common adjustable speed drive.
4. Positive independent tension control.
5. Infinitely adjustable traverse.



Close up view of 5" inch 3 Jaw non slip expansion arbor.

WIM

WIRE INSULATING MACHINERY, INC.
Division of Machinery Electrification, Inc.
35 HUDSON ST. NORTHBORO, MASS.

PEAK PERFORMANCE with

PERMAG

DRAWING COMPOUNDS

Over thirty years of successful experience with leading wire manufacturers provide the greatest assurance of better production with PERMAG wire drawing compounds.

Formulated in the Magnuson laboratories for guaranteed peak performance, PERMAG compounds consistently prove themselves ideal for all types of wire drawing, for both production and economy.

FOR WIRE CLEANING, too, PERMAG offers a group of completely tested formulas that will eliminate pickling trouble and speed drawing production.

A Magnuson representative will be glad to demonstrate the proven superiority of PERMAG cleaning compounds. Or, if you wish, a letter will bring you a complete analysis of your problem, without obligation.

MAGNUSON
PRODUCTS CORPORATION
50 COURT ST., BROOKLYN 1, N. Y.
In Canada: Canadian PERMAG Products, Ltd., Montreal

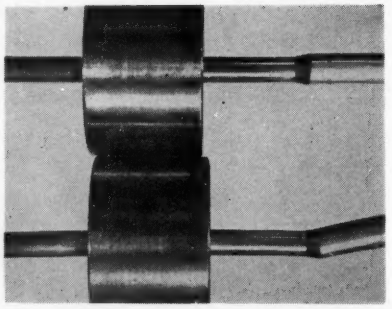


Fig. 4—Die Entry. At Top: Non-Axial Entry. At Bottom: Axial Entry. * * * * *

will eliminate many drawing problems and reduce die scratching and wire breakage. Proper entry can best be checked as illustrated by a close examination of the die contour left on the wire. If entry is not axial, the contour on the wire will indicate how the die should be adjusted. The most common cause of non-axial entry is the camber in the wire coming off the preceding capstan. In machines which have adjustable die holders, alignment is easily taken care of. On

For Higher Output
Closer Tolerances
Faster Start Ups
Lower Maintenance

Great claims? No, real facts. Let us *demonstrate* to you the superior performance of these new extruders with this exclusive combination of design features: Le/D Ratio of 20:1, Fully Automatic Thermo-Control, Herringbone Gear Transmission, Heavy Duty Thrust Assembly, Flexible Coupling and Completely Wired Control Cabinet. Available with Le/D ratios of 16:1, 20:1 and vented 24:1 in 2½", 3½", 4½", 6", and 8" sizes.

Technical bulletins No. E-2, E-3 tell you how you can get more pounds per hour of better quality extrusions.

PRODEX TECHNICAL BULLETINS

Get bulletins today.

PRODEX EXTRUDERS

PRODEX
PRODEX CORPORATION
FORDS, N. J. • HILLCREST 2-2800

constant slip machines which do not have adjustable die holders, axial entry can often be approached by removing wraps from the preceding capstan. Axial entry can also be acquired by use of adjustable rollers ahead of a die.

★ ★ ★

Overdraft in a single die or excessive total reduction should be avoided and practices used which are most economical. Maximum reduction in area per die should ordinarily not exceed 35%. Ideal drafting is maintained between 20 to 30%. The mechanical properties of the as-received rod will show a normal variation and the drafting practice must be set to draw properly the normal redraw rod used.

★ ★ ★

As with entry, axial exit is also a prerequisite of consistent good quality drawn aluminum wires. Angular exit produces a wild drawn product. Vibration of exiting wire produces waviness in the finished product. Vibration can be eliminated by using proper dampening techniques behind last die.

★ ★ ★

The finished product from drawing operations should be handled with the same precautions as emphasized in other sections of this paper. Take-up spools should be in good repair with the inside flanges free of burrs and scratches. Coils should be tied compactly with twine or soft aluminum tie wire, and stripper spiders should be free of any surface imperfections which might snag and mar the inside diameter of the coil.

★ ★ ★

The speed for drawing aluminum is dependent upon the alloy, size, condition of the entering rod or wire, ideal set-up of the drawing machine, and ideal drafting. Proper lubricant and lubricant temperature will also play a most important part in efficient drawing speeds. Speeds as high as 5,000 f.p.m. are commonly used.

★ ★ ★

Drawing quality aluminum wire requires the proper use of the basic principles previously listed. Proper care and handling at all stages of fabrication, good die design, axial

DANFORTH

FIRST QUALITY—PROPERLY-GRADED

DIAMOND POWDERS

Will give you maximum • • •

Value • Service • Economy

For this you pay a little more in first cost, but you save in faster work, in superior die finish and in better wire drawn. DANFORTH POWDERS are uniform in purity, quality, grain shape and accuracy of grading.

COMPLETE RECLAIMING SERVICE

The DANFORTH PROCESS of reclaiming produces powders that are *guaranteed* to be 99% or better pure.

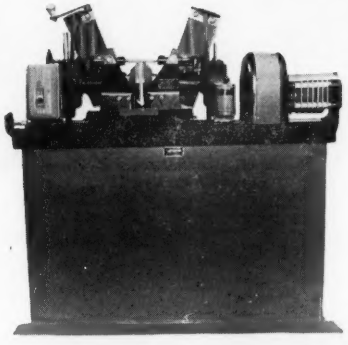
Write today for information on diamond powders.

C. W. DANFORTH COMPANY

P. O. Box 448 Established in 1912 **Youngstown, Ohio**

PROFITABLE STRIPPING

OF YOUR SCRAP AND REJECTED WIRE & CABLE IS GUARANTEED WHEN YOU HAVE THE RIGHT MACHINE ON THE JOB.



Many of our machines have been in service up to 10 years. Our later MODEL "526" (pictured), with a capacity of 5/16" to 6", is now the accepted leader in the scrap and salvage trade. Strips short or long lengths, or off the reel.

For FAST and CLEAN CUTTING, in most cases actually taking the cable apart. No other machine can match the patented cutting action of the "526".

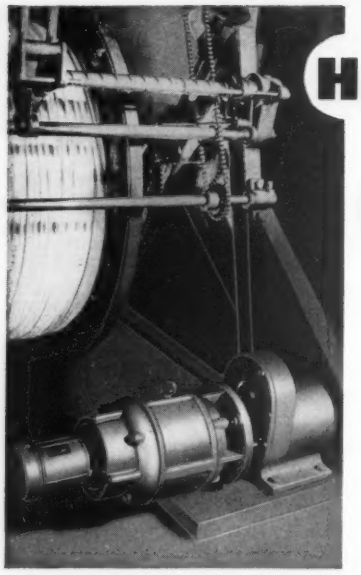
SAVES ALL RUBBER, PLASTIC, LEAD, COPPER AND ALUMINUM

Several models available for small or special work and plastic tubing.

Detailed information available—ask for it

HOWARD A. BURDWOOD, INC.

P. O. BOX 2115, 120 THADEUS ST., SO. PORTLAND, MAINE



Hobbs-Alquist

WINDING ENGINEERED FOR WIRE MILLS

You can profit from Hobbs-Alquist winding Engineering if you wind ferrous or non-ferrous wire for spooling, respooling for further processing, for tension control of winding or for any other purpose! Hobbs-Alquist alone offers a complete line for winders and winding machinery and a complete winding engineering service.

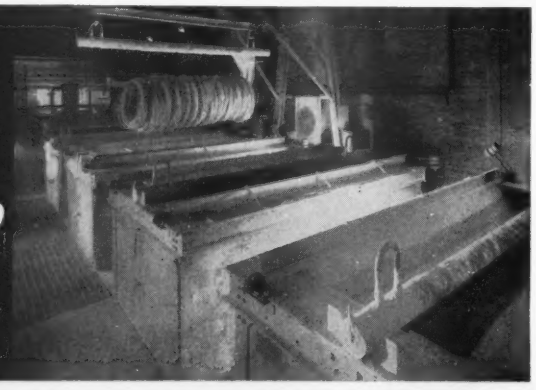
Ask for the new Hobbs-Alquist Winding Engineering brochure . . . it completely describes and illustrates the winders, winding machinery and the engineering service.

Your First Step To Winding Savings !

HOBBS MANUFACTURING CO.
35K Salisbury St. • Worcester, Mass. • DEPT. 370-5
EST. 1882

carl mayer

HI-SPEED REGISTERED **ROD BAKERS**



Faster baking, greater fuel economy, maximum production efficiency are just a few of the results of the exclusive heating arrangement of the Carl Mayer Hi-Speed Rod Baker. It also has a patented blow-off feature which removes moisture without damage to coils.

Here are just a few of our many satisfied customers:

American Steel & Wire Co.
Atlas Steel Co.
Colorado Fuel & Iron Corp.
Crucible Steel Co. of America
Driver-Harris Co.
B. Greening Wire Co., Ltd.
Indiana Steel & Wire Co.
Jones & Laughlin Steel Corp.
Republic Steel Corp.
Sheffield Steel Div., Armco Steel Corp.
Steel Company of Canada

Write for Bulletin No. 350

Patent Nos.
U. S. A. 2,296,361
2,323,828
2,235,559
Canada 396,144
401,589

THE **carl mayer** CORP.
3030 EUCLID AVE., CLEVELAND 15, OHIO

OTHER PRODUCTS: Core Ovens • Mold Ovens • Welding Rod Ovens • Heat Treating Ovens & Furnaces • Special Processing Equipment and Accessories.

entry into die, and good drawing lubricants should insure quality wire.

The Progress of the Properzi Process

(*Continued from page* 1195)

double the power output that it had at the close of the war, and in another ten years, it will have twice as much as it has now. Consider, therefore, the enormous tonnages of conductor metal that will be required and consider the great percentage of aluminum that will be used.

★ ★ ★

Ilario Properzi has asked me to extend his greetings to the members of **The Wire Association,** which I am pleased to do. It was my pleasure to introduce him to many of you at the November, 1953 meeting in Chicago, which he addressed. I should like to quote the closing sentence of his comments at that time:

"The promise of continuous processes is, after all, one of stability for metal costs in the face of general inflationary trends, putting metals into a 'best buy' category increasingly with the passage of time."

★ ★ ★

Thank you for your kind attention.

Certain Aspects of the Operation and Maintenance of Properzi Continuous Casting and Rolling Mill

(*Continued from page* 1192)

mill is a highly skilled job. Since the quality of the rod depends mainly on the quality of cast bar, it is essential to have a very good consistency casting at fairly constant temperature. Hence, the success of the process depends on how well the casting machine is operated.

★ ★ ★

The operator must attend to the following points in getting a good casting:

a) **Metal feed must be at constant temperature and must be regulated to maintain a steady level in the holding pot.**

b) **The metal in the holding pot must be clear. The film of oxide on the metal surface must be skimmed off periodically.**

c) **The level of metal in casting wheel cavity must be maintained steady. This is achieved by adjusting the**

speed of the casting wheel using an oil pattern over the steel belt for visual indication of metal level. A low metal level results in shrinkage at the centre of the cast bar and will show up as splits in the finished rod. A high metal level will result in overflow of metal.

d) The endless steel belt must bear evenly on the casting wheel, otherwise, fins will be formed in the bar, which will show up as scales in the rod.

e) The steel belt must be completely dry. Water particles adhering to the inside surface will cause steam-locks in the bar surface, which will show up as scales and pitting in the rod.

f) The temperature of the cast bar should be maintained steady by adjusting the cooling water supply. Variations in temperature will vary the physical and electrical properties of the finished rod.

★ ★ ★

The ideal operating temperatures using Alcan 6059 or equivalent grade metal have been found to be as shown below:

Pouring temperature	1320 to 1330° F
Temperature of cast bar	800 to 850° F
Temperature of rod leaving mill	300 to 350° F

Maintenance

Furnace: Breakdowns in induction furnaces are mostly due to failure of inductor linings. In the case of the inductor linings in Ajax furnaces for aluminium, the average life is about twelve to fourteen weeks only. This is a very serious handicap in the continuous operation of the mill. A better lining material resistant to progressive absorption and penetration of aluminium, is yet to be developed.

★ ★ ★

Casting Machine: Most of the breakdowns in a Properzi mill occur in the casting machine, and the most frequent is failure of the feeding spout. Feeding spout, originally of cast iron, has been replaced by a compressed asbestos mixture, known by the trade name "Marinite". But the life as yet does not exceed eight to ten hours. Failure of the feeding spout happens in two ways:

a) by progressive clogging of metal on the sides, resulting in the final closure of the tube-opening; and

b) by leaks due to breakage of the spout.

★ ★ ★

Clogging inclusions can be

When your problem is

WIRE DRAWING LUBRICANTS
(Copper, Alloys or Aluminum)

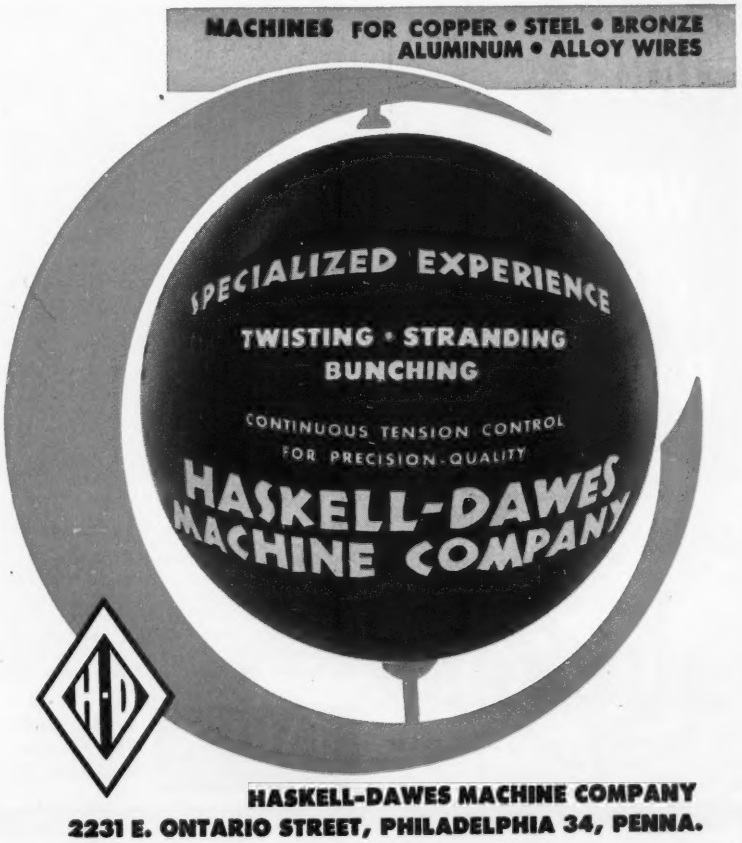
ELEVATOR or AIRCRAFT CABLE SHIELD

The experience of our engineers, internationally known specialists in lubrication, is available to you without cost. Write us. The Ironsides Company, Columbus 16, Ohio.

also producers of weatherproof and flame-resistant wire coatings

SHIELD PRODUCTS

Ironsides



For Superior Results Use

ROME

WIRE DRAWING COMPOUNDS

for

STEEL, COPPER, BRASS, ALUMINUM, ETC.

These new compounds for both WET AND DRY WIRE DRAWING have been under development and field test for 2 years and are showing superior results in leading wire mills, with savings in wire production—and in *original* cost.

Write or telephone for full information

ROME SOAP MANUFACTURING COMPANY

SIXTH STREET • Tel.: Rome 139 • ROME, N. Y.

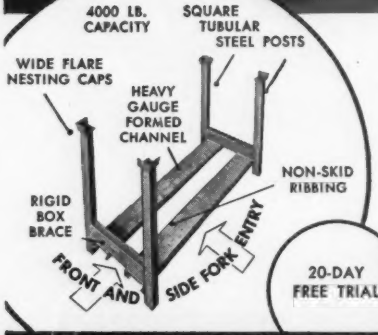
— *MANUFACTURERS OF INDUSTRIAL SOAPS SINCE 1896* —

JARKE

PORTABLE

WIRE COIL RACKS

COURTESY HOLO-KROME SCREW CORP.



Solve Wire Coil Storage Problems

Makes handling and storing of unwieldy wire coils a simple one-man operation. Improves plant housekeeping, saves space, provides positive inventory control. Front and side fork entry permits closer stacking and greater maneuverability in narrow aisles. Saves time, labor, cuts costs. Standard and special sizes.

20-DAY FREE TRIAL

JARKE MANUFACTURING COMPANY

Send for Details
5405 Broadway
Chicago 40, Ill.

MODULAR STORAGE SYSTEMS FOR METAL INDUSTRY • STEELMOBILE

melted down by heating the spout periodically with an oxy-acetylene flame and scraping off the residues from the sides.

★ ★ ★

An equally serious, but less frequent, casting wheel trouble is breakage of the steel belt. Broken belt will cause an overflow of metal and hence defective belts must be promptly replaced.

★ ★ ★

Less frequently, yet often, is encountered deformation or distortion of the copper ring. Distortion of the ring is caused by uneven temperature and can be eliminated by efficient and uniform cooling of the ring. This point has been rectified by providing cooling fins for the casting ring in machines of the latest model, viz. Model No. 6 (fig. 7).

★ ★ ★

More serious is the possibility, due to failure of electric supply, of the casting machine stopping while casting is in progress. Metal overflows and falls over the driving gears of the casting machine. If this happens, the wheel assembly has to be dismantled to remove solidified metal from between the gear teeth.

★ ★ ★

Rod Mill: The rod mill is usually trouble free. Rolls should be set for specific openings, using gauges supplied with the equipment. If due to any reason the setting is altered, bar will build up between stands ultimately causing slips in rolls. This may even result in breakage of driving gears and/or rolls.

Conclusion

We are glad to learn from Mr. Properzi that most of the foregoing trouble-spots on the casting and rolling equipment have been obviated in the Model No. 6 machine which is considered to be the most efficient version of the Properzi process for aluminium rolling.

★ ★ ★

Even in spite of these teething troubles and operating difficulties,

the Properzi process has come to stay for the production of aluminium rods for electrical conductor manufacture. Suitable grade of metal for use on the Properzi so as to result in aluminium rod both physically and electrically conforming to American and European standard specifications has already been evolved. We get our supplies of the correct grade metal from the Indian Aluminium Company Limited.

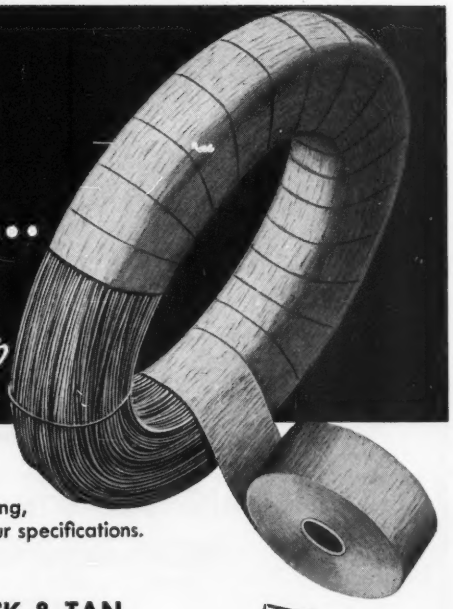
* * *

For the first time this invention has made the rod rolling practice available to small-scale manufacturers, who, otherwise, would have been dependent for their rod supply from the bigger units. Further, salvage and recovery of high grade scrap and transformation of same into usable rods has also been made possible. The Properzi process allows great savings in transformation costs with the minimum labour strength: some plants claim that in the manufacture of aluminium rod, adoption of the Properzi process will effect a cost saving of several cents per pound as compared to the conventional rolling process.

* * *

In India today, we have launched on ambitious plans for power generation, transmission and distribution. Most of our 600,000 villages are yet to be electrified, and the demand for aluminium conductors during the next few decades will continue to be on the increase. Our workable reserves of aluminum ore are considerable (over fifty million tons). A dispersed aluminium conductor industry, self sufficient in respect of its rod requirements, will be in the best position to meet the aforesaid heavy conductor demand. It is in this context that the Properzi process has offered the most practical solution. The Model No. 5 equipment which we are operating at Kundara is fairly satisfactory and the Model No. 6 which has just been ordered for our new mill at Hirakud in Orissa State, we are confident, will prove even more trouble-free and efficient in operation.

for TIGHTER ALL-ROUND PROTECTION... use NATCO Spiral Wrap



Strong, with a built-in stretch, NATCO's contour-hugging spiral wrap is superior for wire coils, tubing, metal rods and bars. Made to your specifications.

- PLAIN • WAXED
- WATERPROOF • BLACK & TAN
- GREASEPROOF • REINFORCED
- ANY SIZE ROLL—*for machine or hand-wrapping*

Write today for sample rolls, prices and complete information.

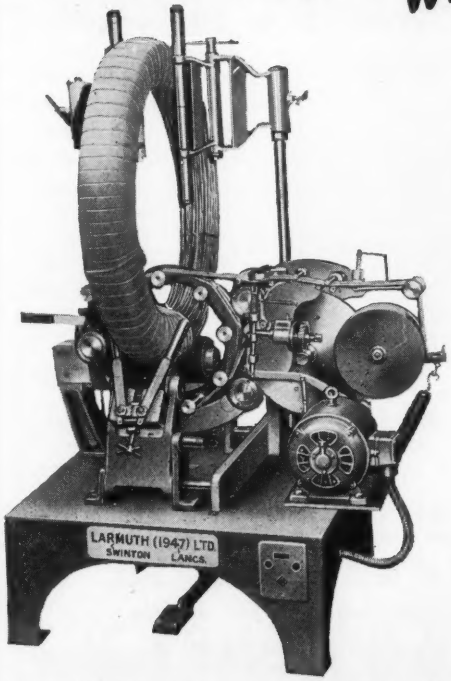
Larmuth power wrapping machines or special tension and edge-folding attachments for your machines.

NATIONAL WATERPROOF PAPERS, INC.

Manufacturers of Protective Papers, Liners and Bags Since 1903

BEVERLY 1, N. J.

LARMUTH Spiral Wrapping MACHINES



are built to finest British engineering standards and are in use throughout the world for spiral wrapping of Motor Tyres, coils of Wire, Strip, etc., from 3" bore upwards. Also straight length Tubes, Bars, Rods, etc.

"BOUND" to get there safely.

Please send detailed dimensions of your products.

LARMUTH of England

LARMUTH (1947) LTD., EAST LANCASHIRE ROAD, SWINTON, MANCHESTER, ENGLAND.

Telephone: Swinton 1015

FOR THE FINEST IN

METAL PICKLING COMPOUNDS

SPECIFY

PARKIN PRODUCTS

SUMFOAM—pickling compound

NEP—acid inhibitor

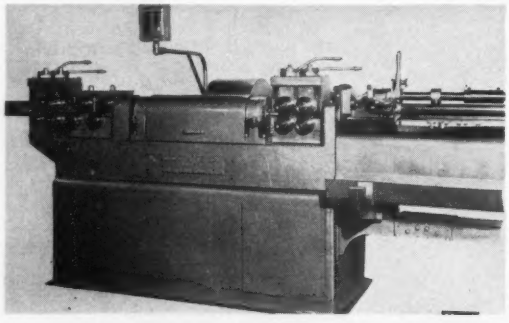
NEPTUNE—accelerator

THE PARKIN CHEMICAL COMPANY

HIGHLAND BUILDING, PITTSBURGH 6, PA.

New, Fast STRAIGHTENER and CUTTER

Handles 1/4" to 1/2" Wire—3" to 50' Lengths



Model 9A, pictured, is for ferrous or non-ferrous heavy wires. Other models accommodate smaller stock.

The 9A feed and speed can be varied from 70 to 200 feet per minute.

OTHER FEATURES

Wichita low-inertia air tube clutch and air brake makes quick, clean and positive cut-off possible. Electric actuated trip. Motor control switch on swinging pendant. Tool storage in base. Bundling brackets. End pull-through device. Two 4-roll feed housings for positive feeding. Many other refinements—all features of the 9A and other models for finer wires.

ALSO MANUFACTURERS OF WIRE REELS AND HI-HATS.

Send your requirements and ask for details.

The Geo. C. PATTERSON MACHINE Company

3409 Trumbull Street • Cleveland 15, Ohio

Measurement of Electrical Conductor Characteristics

(*Continued from page* 1183)

25C. The conductor temperatures Θ for t = O are 116, 79, 71 and 59C for the four wind speeds (in all three diagrams of Fig. 9). These figures compare closely with 114, 79, 70 and 59C obtained from Fig. 5 for 1060 amp, and give an idea of the overall accuracy of such tests.

★ ★ ★

I have described, briefly, the conductor measuring facilities of Kaiser Aluminum, indicated a novel method for determining "effective" temperature of large size conductors, and illustrated the method by measurements made, in the Conductor Laboratory, on one three-layer ACSR conductor.

★ ★ ★

Measurements on different types of conductors have preceded this study. Work on still others is to follow. Multiplex aluminum cable has been investigated extensively, and the results have been reported to the profession (Ref. 5). A publication on ACSR conductors is contemplated. Completion of the three-phase facilities will permit testing of three-conductor cable, with and without metal sheath, cables installed in pipe, etc. The aim will be always to supply accurate, factual, reproducible data which may corroborate existing analytical procedures, or else lead to a refinement of them.

Acknowledgement

Dr. E. W. Greenfield, Head of the Electrical Engineering Branch of the Department of Metallurgical Research, suggested the publication of this study. The management of the Department approved of it. I am particularly indebted to **Mr. Earl Hazan** for the measurements on the "Curlew" conductor.

Bibliography

1. **Kaiser Aluminum Electrical Conductor Technical Manual, Kaiser Aluminum and Chemical Sales, Inc., Chicago 11, Ill. 1954.**
2. **Kaiser Aluminum Research Laboratory for the Measurement of Electrical Conductors, L. F. Roehmann, pamphlet, 8 pp., Kaiser Aluminum**

and Chemical Sales, Inc., Chicago 11, Ill. 1955.
3. For instance Ref. 1, p. 11. For a more detailed table: Copper Losses in Large Cables at Power Frequencies. A. H. M. Arnold, J. IEE vol. 76, 1935, p. 299.
4. For instance Electrical Coils and Conductors (book) H. B. Dwight, p. 220, McGraw-Hill Book Co., Inc. 1945.
5. Current Rating of Aluminum Multiplex Cable. L. F. Roehmann AIEE 56-8. Power Apparatus and Systems, August 1956, p. 505.

The Effect of Salts in Formvar On the Dielectric Properties of Formvar Alkyl-Phenolic Coated Magnet Wire

(*Continued from page* 1211)

redissolved in acetic acid — water solvent, precipitated with distilled water and washed thoroughly. Only a slight improvement, if any, in dielectric strength over the original Formvar control experiments was noted.

★ ★ ★

In summary the following points are noteworthy:

1. **The ammonium acetate content of Formvar resin has little or no effect on wet or dry dielectric strength of Formvar-phenolic coated magnet wire. The difference between wet and dry dielectric strength in the ammonium acetate experiments is probably due to the ammonium sulfate content normally present in the resins used in these experiments.**
2. **Formvar, containing ammonium sulfate within the range called for by Shawinigan's specifications, produces a Formvar-phenolic magnet wire coating whose wet or dry dielectric strength is above the 1500 volt/mil minimum specification established by NEMA.**
3. **Salts are controlled in each lot of Formvar resin to insure against its contributing to any dielectric difficulties with Formvar-phenolic magnet wire.**

Acknowledgement

The authors wish to thank Shawinigan Resins Corp. for permission to publish this paper.

References

(1) A. F. Fitzhugh, E. Lavin and G. O. Morrison, J. of Electrochem. Soc., 100, 351, (August 1953).
(2) National Electrical Manufacturers Association Publication MW-15, "Specifications for Vinyl Acetal Coated Round Magnet Wire," National Electrical Manufacturers Assn., 1955.
(3) JAN-W-583 "Joint Army-Navy Specifications for Magnet Wire," U. S. Govt. Printing Office, April 1948 (including Amendment 5, May 1954).
(4) J. W. Mellor, Inorganic and Theoretical Chemistry, Vol. II, p. 702.

MIL-W-16878

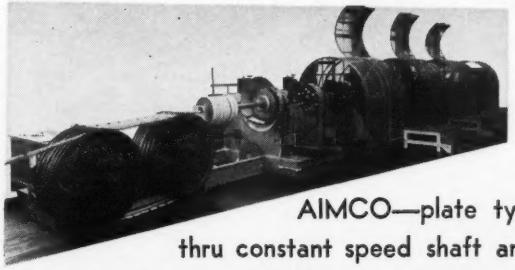
IF YOU ARE HAVING DIFFICULTY IN MEETING THE REQUIREMENTS OF THESE SPECIFICATIONS, IT MAY PAY YOU

TO COMMUNICATE WITH

ELECTRONIC RUBBER COMPANY
69 SUNNYSIDE AVENUE
STAMFORD, CONN.

MANUFACTURERS OF VINYL COMPOUNDS FOR SPECIFIC END USES UP TO 125° C.

4-WIRE TWISTING MACHINES



CABLE REELS 48" DIA.-31" O. A. WIDTH.

FILLERHEAD 24 PACKAGES 12" DIA., 12" TRAVERSE.

AIMCO—plate type serving head driven thru constant speed shaft and variable speed drive. Taping head 24" pad driven thru constant speed shaft and variable speed drive.

Capstans double 6 groove 42" root diameter. Rates of lay from 3" to 50". Flyer speed 8 steps from 600 to 34 R.P.M. Handles large diameter wires on cradle reels.

An exceedingly efficient and versatile machine.

THE EDMANDS CO. **860 WELLINGTON AVE., CRANSTON 10, R. I.**

from grid wire to 2,000 lbs.

Electric weighing with accuracy of calibration of .25%

This entirely new 1956 Scott Tester

- Opens new worlds of information, putting the study and evaluation of wires on an entirely new plane of accuracy and completeness.
- Gives magnified recordings of stretch up to 200 times actual.
- "Blows up" selected portion of stress-strain graph greatly magnified for detailed study of significant portion.

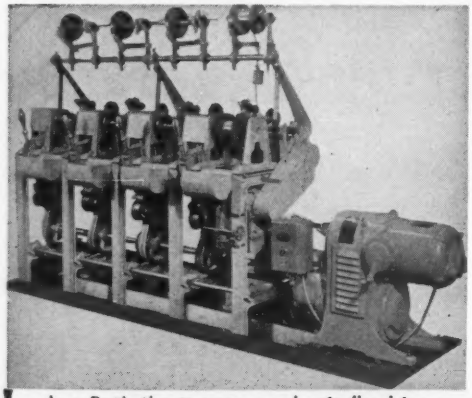
*Trademark

REQUEST "CET BULLETIN"

Your Testing Problem is Our Business. State your problem and let us offer suggestions from our 57 years experience.

SCOTT TESTERS, INC. 55 Blackstone St. Providence, R. I.

Scott Testers — Standard of the World



1900-HV MULTIPLE SPINDLE SPOOLER

SPECIFICATIONS
Size Range: .010" to .080" or heavier if soft and many flat wire sizes.
Max. Spool Size: 16" flange diameter.
Capacity: usually 4 to 8 spindles.

The 1900-HV Spooler is a rigid, precision machine which will consistently produce a uniform, dense wire lay. Both the traverse and spindle drives are regulated through wide-range, stepless, variable speed units, eliminating change gears. The 1900-HV is completely adaptable to your particular constant or changing demands. All controls are positive. Adjustments are made accurately with the spooler in operation and without tools.

Both smooth acceleration and rapid stopping is obtained through a single lever at each station. Spool changing is simple and rapid. Anti-friction bearings are used on all shafting and spindles.

Your special requirements can be incorporated into the design. Each machine is delivered ready for operation from your power supply. Payoff stands furnished as extras.

Consult us on your spooling problems.

ROBERT J. EMORY COMPANY
31 East Runyon Street Newark 5, N. J.

The Steel Wire Industry In Australia

(*Continued from page* 1179)

basis; to a man's individual effort where practicable, otherwise to a group, such as the gang on a galvanising plant.

★ ★ ★

Safety, Holidays, etc.: Special attention is paid to safe working and good results are achieved by intensive attention to safe practice, good guarding and housekeeping, at all levels from management to operatives.

★ ★ ★

Rylands Newcastle wire mill has for many years held the safety record for all branches of the Australian steel industry. This is due mainly to the men's interest in safe practice, inspired in great measure by departmental safety committees, whose members are drawn from the workmen themselves, the only staff member being the Safety Officer. He is a member, but not the chairman, of all departmental committees and of the main safety committee at management level. This ensures an effective liaison and mutual interest between the various committees.

★ ★ ★

The departmental safety committees review safety procedure, bring forward suggestions and investigate any accident or near accident in their respective departments, and report to the main committee. The records of this committee's meetings serve to inform the men on decisions and safety matters generally.

★ ★ ★

Compensation is paid at approximately 75% to 85% of the daily wage to men absent from work through accident, the rate increasing with a man's dependents.

★ ★ ★

All men are paid their daily rate for a fortnight's holiday and 10 public holidays per annum and up to one week in a year for absence due to sickness.

★ ★ ★

Distribution: New South Wales

absorbs about 45% of Australian wire production and despatch of products in this State is by rail and road.

★ ★ ★

Rylands Geelong mill delivers products 40 miles by road to Melbourne.

★ ★ ★

Supplies from the Newcastle and Sydney wire mills to the various other States of Australia are by sea to some eight to ten different ports, the greater part of this Interstate material being shipped from Newcastle.

★ ★ ★

Owing to the wide range of special wires produced at Newcastle and the vagaries of present day shipping, it is necessary to carry very considerable stocks in order that material shall be available as ships come on a loading berth.

★ ★ ★

This intermittent delivery results in conditions of storage space and loading not usual in a wire mill and calls for very large warehouse capacity and also facilities for rapid and economic loading of the open railroad trucks used for transit from warehouse to ship's side and for slinging from truck to ship's hold by wharf cranes or the ship's tackle.

★ ★ ★

Consideration is being given to, and trials have been carried out on, compressing and tying wire coils into unit load bundles of 2000 to 3000 lbs. weight as a means of speeding up loading.

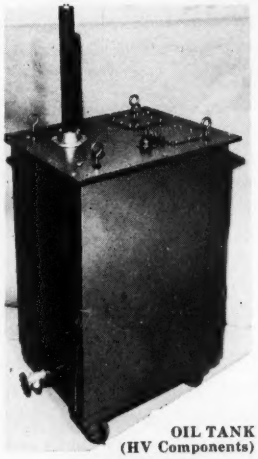
★ ★ ★

As handling of finished products has just been mentioned, it may be permissible to digress and perhaps invoke some discussion by stating that, in general, the greatest field for economics in a wire mill lies not so much in obtaining the ultimate from a wiredrawing machine, etc. as in concentration on handling methods all the way from rods to final despatch. Each step in the manufacturing process is only a pause, so to speak, in a long chain of handling.

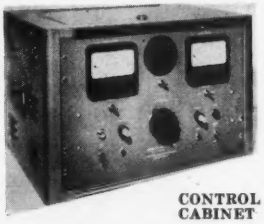
★ ★ ★

100 KV DC TEST SET (Overpotential Testing)

For Non-Destructive Insulation Testing of Sample, or Full Reel Tank Testing.



OIL TANK
(HV Components)



CONTROL CABINET

1. Con. var., 0-100 KV output voltage.
2. Adequate cap. for rapidly charging full reels.
3. Automatic output shorting.
4. External (aux.) interlock provision for test cage.
5. KV meter and current meter for determining leakage resistance—both meters dual range.
6. Adj. overcurrent trip-out—deenergizes HV.
7. Incorporates all safety and convenience features.

Available in other ranges, from 5 KV to 200 KV.

Also, a complete line of Test Equipment for any required test on wire and cable, per IPCEA, NEMA, MIL, JAN, USAF, ASTM, and all other standards.

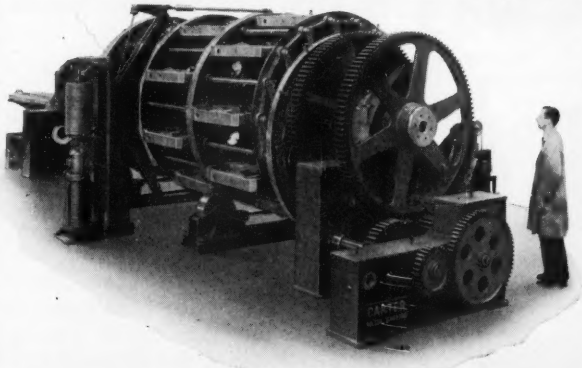
Write, wire or telephone for Test Equipment Catalog.

PESHEL ELECTRONICS, INC. 15 Garden St., New Rochelle, N. Y. Tel.: NEw Rochelle 6-3342

36 BOBBIN STRANDING SECTION

FOR LOCKED COIL WIRE ROPE

Arranged in 4 bays of 9 bobbins each, 18 floating & 18 fixed or rigid. SIZE OF BOBBIN: — 22.5" diameter. SPEED: — 14/18 revs. per minute with increases of one revolution. Maximum Speed:—35 revs. per minute. Geared de-torsioning arrangements. Cage supported on 2 sets of rollers.



BOBBIN WIRES REMAIN IN CONSTANT TENSION WHEN ONCE SET, DUE TO TENSION DEVICE.

BOBBIN SPINDLE SAFETY LOCKS & SLAP BUSH.

ELECTRO-HYDRAULIC BRAKES.

GEAR CHANGE QUADRANT WITH LOCATING PIN.

SAFETY GATE GEAR CHANGE.

MAKERS OF PLANT FOR

ELECTRIC CABLE, BRAIDING and WIRE ROPE

B. & F. CARTER & CO., LTD.

BOLTON, ENGLAND. TELEGRAMS: "BRAIDERS BOLTON"

for **extra tonnage**

from your bar stock and wire dies

coat with

BORAX 5 MOL.

Borax and Borax 5 Mol Offer Many Advantages as a Coating Material

Here is dust-free, granular material that is readily soluble in water and dries quickly. The residual film is tight yet pliable... won't flake off! Borax is safe to use, easy to handle, and non-irritating to the skin. You can feed stock faster and you get longer, more accurate performance from your dies.

Check these advantages of borax-coated stock:

- COMPATIBLE WITH DRAWING LUBRICANT
- BETTER WORKING CONDITIONS
- FASTER BUTT WELDING
- LONGER DIE LIFE
- LONGER STORAGE WITH SAFETY
- CLEANER TO HANDLE IN TRANSIT

Write to our Technical Department for further information

United States Borax & Chemical Corporation

PACIFIC COAST BORAX COMPANY DIVISION

100 Park Avenue, New York 17, N.Y.
630 Shatto Place, Los Angeles 5, Calif.

Los Angeles · New York · Chicago · Kansas City · Philadelphia · Cleveland

Every movement of a coil on to, or off, stillages, mill trucks, stacks, machines, etc. represents an item of cost.

★ ★ ★

The suggestion is put forward for comment that probably the most efficient handling is by ram lift truck carrying about 4000 lbs., the coils being tunnelled on the floor. Admittedly this involves very large floor areas, particularly in the warehouse, with additional travelling of lift trucks, but labour is reduced to the minimum.

★ ★ ★

As mentioned earlier, economic handling of wire for further processing in the mill lies in the use of the longest practicable lengths of wire, whether they be in coils, on stripper frames or reels.

★ ★ ★

Marketing: Distribution of fencing materials is through the larger merchant and trading houses in each State, some selling to country storekeepers for local distribution and others direct to the man on the land.

★ ★ ★

Manufacturers of wire products buy their requirements direct from Rylands and Lysaghts. There is no price differential for quantities over 5 tons, consequently the smaller manufacturers are under no disability and thus the growth of industry is encouraged.

★ ★ ★

Most Government departments and the larger public utilities purchase their requirements direct from the wire mills.

★ ★ ★

Rylands and Lysaghts being established to serve all Australia and not merely one State, there is a common price structure for delivery c.i.f.e. any main Australian port, so that the distant buyer in South or West Australia pays the same price as one adjacent to a wire mill.

★ ★ ★

Australia's requirements are the first call on the industry and, with

ANACONDA®

copper and copper-alloy WIRE in all Commercial Tempers and Sizes including Round, Flat, Hexagonal and Special Shapes.

WIRE FOR SPECIAL PURPOSES

Copper, Brass, Bronze, Everdur, Formbrite* (Superfine-grain Brass) and Nickel Silver in special grades for the manufacture of rivets, nails, pins, piano hardware, etc. Fine Wire on spools.

RESISTANCE WIRE

Nickel Silver.

WEAVING WIRE

Bronze (Antique Golden), Brass, Nickel Silver, Everdur*, Phosphor Bronze, Copper and Fourdrinier Wire.

SPRING WIRE

Brass, Phosphor Bronze, Duraflex* (Superfine-grain Phosphor Bronze), Everdur.

*Trade Mark Reg. U.S. Pat. Off.

THE AMERICAN BRASS COMPANY

Waterbury 20, Conn.

District Sales Offices in Principal Cities

Warehouses in:

Chicago, Cleveland, Milwaukee
Philadelphia, Providence, Dallas

52212

PLANDEX "Hi-Quality" Plastics Reworking Service

Turns Your Waste into Profit!

BLEEDER STOCK
CABLE STRIPPINGS
AND CUTTINGS—
Reprocessed To Original Extrudability

Thermoplastics Restored
FOR REUSE IN JACKETINGS AND INSULATIONS

VIRGIN MATERIALS
Compounded to Your Recipe!

Turn your waste into valuable by-products the Plandex controlled quality way. Every job benefits from thorough experience, modern customized equipment including dual worm compounder-extruders and careful accurate interpretation of your specific requirements. We serve the industry's leaders throughout the U.S. and Canada.

Write for literature or sales engineering appointment.

PLANDEX
CORPORATION
DOWNINGTOWN, PA.
PHONES 1419 OR 1438

supplies to the sister Dominion of New Zealand, at present absorb practically all production.

World War II

In proportion to its population, Australia made a very substantial contribution to munitions and supplies to navy, army and air force requirements. In playing their part the wire mills and wire rope works developed many new classes of wire and products, allocating over 90% of output to the defense and essential services of the Allies in the Australian, Middle East and Pacific zones, including considerable quantities to the American forces in the latter zone.

★ ★ ★

These defense supplies included 3000 tons of anti torpedo and submarine nets, 1000 tons mine mooring and paravane ropes, 16,000 tons of barbed wire, 50 million yards of camouflage netting, 16 million steel pickets for entanglements, 200,000 miles of field telephone cable, insulated by Olympic Rubber Co., wire for 80 million armour piercing bullets, aircraft wire and control cable and a wide variety of sundry requirements.

Conclusion

This review of the Steel Wire Industry in Australia would not be complete without reference to the wonderful spirit of friendly cooperation and willingness to afford technical information so freely given by so many American wire mills during visits of the Companies' officers, who return to Australia with a warm regard for the hospitality, friendships made and help so freely extended in your great country, with which we in Australia feel so closely associated in our common Pacific interests.

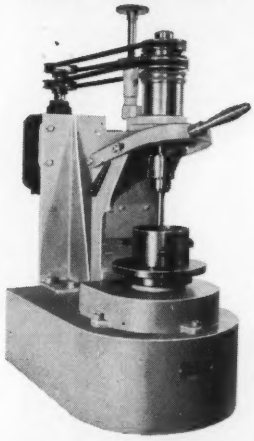
★ ★ ★

In like measure cooperation with the Wire Industry in Britain has also been a source of great pleasure and as a relatively young country with a steel industry less than half a century old, this spirit of cooperation by all our friends is deeply appreciated.

NEW!

DYKREX
"IT CORRECTS THE DIE"

Medium Duty Lapping or Ripping Machine



At A NEW LOW PRICE

Made of welded steel fabrication. Same quality construction as all Roos and Dykrex Wire Die Finishing Machinery.

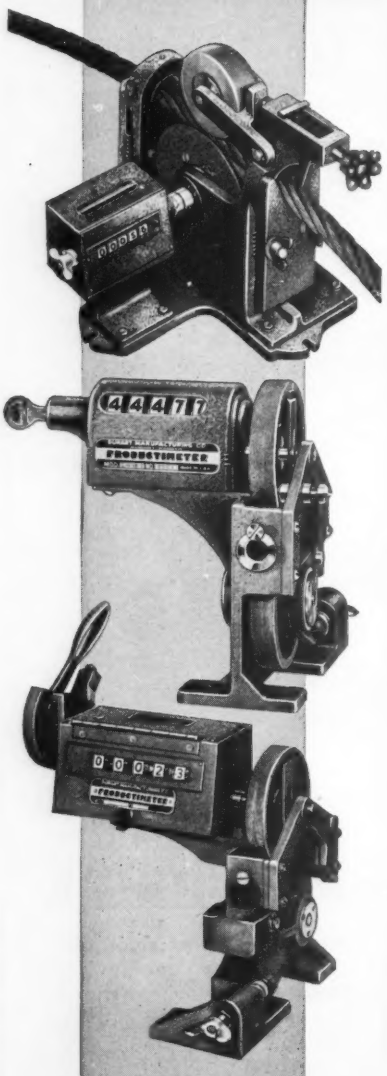
We make a full line of Rippers, Lapping Machines, Drillers, Polishing Machines and Pin Grinders. Send for catalog—NOW

Manufactured by
DYKREX CORP.
Newark 4, N. J.

Factory—17-19 Grove Street
Montclair, N. J.

Phone MOntclair 2-5690

PRODUCTIMETER
WIRE MEASURING MACHINES
Fast . . Accurate . . Dependable . . Legible



Productimeters measure all types of wire from .010 to 1½ inches in diameter . . . at speeds up to 5,000 feet per minute. They eliminate "guess-work" . . . insure profitable operation in your plant.

Send for Catalog No. 40

DURANT MFG. CO.
1918 N. Buffum St. Milwaukee 1, Wis.
18 Thurbers Ave. Providence 5, R. I.
Representatives in Principal Cities

PRODUCTIMETERS
SINCE 1879 *Count Everything*

Swaging Machines by the Carload

A full freight carload of swaging machines built by **The Fenn Manufacturing Co.**, Newington, Conn., is on its way to the West Coast to fill an order from one of the country's leading producers of nonferrous tubing. It represents an important step in the company's plan to standardize its entire line of swaging machines with Fenn precision equipment. The shipment of thirteen units includes Fenn Models 2F, 3F, 4F, 5F, and 6F Swaging Machines, that will be used for pointing nonferrous tubing prior to drawing. The variety of swagers will permit production to be kept at a maximum by offering a range of tubing capacities from 1 in. to 4-½ in. in diameter. The savings represented by the pointing operation on such quantities of tubing may be realized from the fact that there is no scrap from pointing the tubing, since swaging shapes metal by displacement rather than by removal. Swaging is not limited to pointing, but finds numerous other applications in forming and assembling operations as well. Alone, or equipped with the various Fenn accessories, the swaging machine is a useful precision production tool capable of turning out an improved finished product. Superior surface finish, improved grain structure and high tensile strength are but a few of the qualities imparted to the product by swaging.

Coleman Moves to Enlarged Quarters

David Coleman, senior partner of **Coleman Cable & Wire Co.** of 4515 W. Addison St., Chicago, announced in September the removal of their Chicago general offices and warehouse to greatly enlarged facilities at 3919 Wesley Terrace, Schiller Park, Ill. (A suburb of Chicago.)

★ ★ ★

A total of 30,000 additional square feet of space have been added, incorporating an all steel and aluminum building, providing about 250,000 square feet of space devoted to the merchandising of nearly every type of electric cable and wire.

KEL-F® PLASTIC PRICE REDUCTION

INDUSTRY'S MOST "VALUABLE" PLASTIC NOW COSTS LESS THAN EVER

Starting at $6.00/lb. for low density grades in volume

If, because of the cost factor, you have to forego the advantages of fluorocarbon plastics and substitute other materials—then the lower price for KEL-F Plastic should be welcome news!

This hard, dense thermoplastic offers a combination of properties unobtainable in any other material: ready moldability, extreme resistance to chemical attack, heat and cold, excellent dielectric properties.

All these characteristics, plus high compressive strength, zero-moisture absorption, non-wettability and abrasion resistance, place KEL-F Resins high on the list of wanted plastics . . . in the chemical, electrical, equipment and aviation fields.

If you haven't already, now is the time to investigate KEL-F Plastic. Perhaps it can help *you* create better products, meet higher performance specifications, or prolong equipment life.

TECHNICAL SERVICE

As always, Kellogg—with its staff of research chemists and experienced technical service team—stands ready to assist you. The facilities of our Customer Service Laboratories are available for the investigation of problems related to the applications and use of KEL-F fluorocarbon materials in your products.

Write for new price list. The M. W. Kellogg Company, Chemical Manufacturing Division, P. O. Box 469, Jersey City 3, N. J.

THE M. W. KELLOGG COMPANY
Subsidiary of Pullman Incorporated

® KEL-F is the registered trademark of The M. W. Kellogg Co. for its fluorocarbon products

(*Continued from page* 1163)

rected toward finding materials for this application.

★ ★ ★

Addition elements including beryllium, sodium, boron, titanium, chromium and molybdenum are classified as secondary additions because of low concentrations in the alloys. The functions of these elements are important in obtaining bright, lustrous and complete coatings on the steel.

★ ★ ★

As shown in Figure 3, beryllium inhibits diffusion between aluminum and iron and is about twenty times as effective as silicon although more expensive than the latter. Small amounts of beryllium, on the order of 0.01 to 0.1% beryllium, tend to reduce the ductility of the coating. Nevertheless, beryllium may be employed because of a second desirable characteristic, namely, its ability to reduce the amount of surface oxide on the aluminum bath. When coating alloys containing silicon and sodium are used, brown oxides sometimes cover the bath surface and stain the coating unless careful skimming is performed. About 0.004% beryllium is effective in preventing the formation of these brown oxides and does not adversely affect the coating ductility.

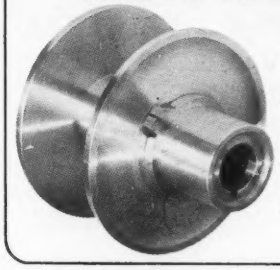
★ ★ ★

Beryllium is not recommended for use in salt bath preheat processes because rapid loss occurs from salt fluxing of the bath.

★ ★ ★

Additions of about 0.002 to 0.009% sodium increase bath wettability and facilitate coating. Moreover, when sufficient sodium is present, eutectic silicon particles are finely dispersed in the aluminum layer, and this appears to improve the ductility of the coating. Laboratory and pilot plant experience has shown that sodium additions are required to avoid dis-

MUSIC WIRE and SPECIAL WIRES
Music Wire for Industrial Purposes
211 sizes Bright Polished, .0015" to .3437"
45 sizes Bright Tinned, .003" to .125"
Aluminum—Annealed—Belt Lacing—Brass, Soft and Spring—Copper, Bare and Tinned
Coppered Steel Spring—Galvanized—Tinned
Monel—Nickel Silver—Pure Soft Nickel—Oil Tempered, Steel Spring, Black Finish
Phosphor Bronze, Spring Temper—Pure Iron Wire—Resistance Wire,
Hoskins Chromel "A"—Stainless, Soft and Spring Temper—Tag Wire, 1000
in an Envelope—Florist Wire—Spooled and Coiled, ¼-½-1-5#
Wires Straightened and Cut to length—Small Gauges—Small orders our specialty
Wires and Strands for the fishermen. Trolling Wires, Copper-Monel-Stainless.
Leader Wires, "Wilstabrite" Stainless and "Silverbrite" Music.
THE MALIN & COMPANY
2514 Vestry Ave. Established in 1884 Cleveland 13, Ohio

Call MILTON for dependable REELS
SPECIAL ADJUSTABLE FLANGE WIRE REEL


One of several types available at Milton in steel or aluminum, this special reel was designed to solve a customer's specific problem. Your inquiries are invited —write for Bulletin 52-W.
MILTON MACHINE WORKS, Inc.
DESIGNERS – ENGINEERS – MANUFACTURERS
MILTON • PENNA.

THE BETTER YOUR WIRE . . .
THE BETTER YOUR PRODUCT!
Choose Cortland GALVANIZED WIRE

Fine products are made from fine-quality materials. That's why so many fabricators and formers select Cortland Brand specialized low carbon wires. Cortland Brand wires are among the finest available . . . made from the best corrosion-resisting, open-hearth steel in Wickwire's own mills. Use them for your products . . . in any of the following types, sizes and finishes.
Cortland Brand
SIZE: coils, spools or straightened cut to length.
FINISH: plain, galvanized, coppered or tinned.
TYPE: stone wire, bookbinder, flat, etc.
WICKWIRE BROTHERS, INC. CORTLAND, N.Y.

WIRE POTS
SPELTER PANS
ANNEALING RETORTS
GALVANIZING PANS
TINNING POTS
LEAD POTS
QUALITY PRODUCTS SINCE 1895
NATIONAL ANNEALING BOX COMPANY
Washington, Pennsylvania

- Cold Drawn Bars
- Wire Drawing
- Straightened & Cut Wire
- Foxweld Reinforcing Fabric
- "Stressrods" for Prestressed Concrete

RODS, INC.

706 Folger Avenue Berkeley, California

WIRE DRAWING MACHINERY
AND EQUIPMENT

FINE WIRE MACHINES • SPOOLERS • POINTERS
PATENTING, TEMPERING, GALVANIZING AND TINNING EQUIPMENT FOR WIRE

WRITE FOR PRICES

SUPERIOR TOOL & MANUFACTURING CO.
172 UNION STREET • WORCESTER, MASS.

STRONG METAL BOUND RETURNABLE REELS

FAST DEPENDABLE SERVICE ON QUALITY REELS, 12" TO 30" DIAM.

Built to take a beating! Built to protect Coated or Insulated Wire from damage! Kiln dried stock — No nails — Bolted, Waterproof, Glued construction.
Especially designed to prevent breaking or splintering.

We Can Solve Your REEL Problems!

WM. McCASKIE, INC., OLD FORGE ROAD, WESTPORT, MASS.
Dial MErcury 6-8845
New York Area: James Love, Wm. McCaskie, Inc., 75 West St., N.Y. 6, N.Y. WHitehall 3-0577
In Canada: E. V. Larson Company, 572 Queen Street East, Toronto 2, Ontario

"PARALAN"

RUST PREVENTATIVES LUBRICANTS

AMERICAN LANOLIN CORP.
Railroad Street
LAWRENCE, MASS.

LANOLIN WOOL GREASE DEGRAS

WAREHOUSES:
Lawrence, Mass.
Pittsburgh, Pa.
Cleveland, Ohio

TELEPHONES:
Lawr.: 3-2729
Pitts.: Montrose 1-0176
Cleve.: Utah 1-6700

continuous coatings at higher coating speeds.

★ ★ ★

Small amounts of boron, titanium, chromium, molybdenum, zirconium, vanadium and tungsten give luster to aluminum-silicon base coating alloys. Molybdenum also appears to increase bath wettability. Elements which aid in brightening the alloys include magnesium and zinc. However, they do not produce desirable effects in combination with some addition elements. For example, zinc slightly improves the brightness of aluminum-silicon-chromium alloys, but it decreases the luster in aluminum-silicon-zirconium alloys. Examples of typical concentrations of secondary elements in alloys are shown in the table.

★ ★ ★

Typical Concentrations of Alloying Elements In Per Cent

0.03	Boron
0.04	Titanium
0.15	Chromium
0.15	Molybdenum
0.20	Zirconium
0.20	Vanadium
0.20	Tungsten
0.50	Zinc

★ ★ ★

However, it should be noted that it is not desirable to make all of these additions to a single alloy. The amounts of these elements which can be used are limited because of their tendency to form insoluble intermetallic compounds with aluminum in the same manner as iron. For example, the total concentration of molybdenum plus chromium should be less than 0.50%.

★ ★ ★

The addition elements may be added to the molten base coating alloy in the form of aluminum hardeners to adjust or maintain the alloy composition. The hardeners consist of comparatively high percentages of the addition element in aluminum pig. Adding the elements to the bath in this way facilitates dissolution of the element in the melt.

★ ★ ★

Cleanliness of the aluminum bath is maintained by periodic fluxing with dry chlorine gas to remove insoluble oxides. Entrapped impurities may reduce the corrosion resistance and impair the appearance of the coating. Normally, fluxing is performed once each shift.

★ ★ ★

Sodium is removed from the alloy during chlorine fluxing, hence replenishment is necessary. General practice is to add an amount calculated to bring the bath to 0.02% sodium. Enough sodium is lost as dross to obtain a concentration of about 0.005 to 0.009% sodium in the aluminum.

★ ★ ★

If beryllium is desired, additions are required periodically to replace that lost through oxidation and chlorine fluxing. These additions are made by adding aluminum-5% beryllium hardener to maintain the composition at 0.004% beryllium.

★ ★ ★

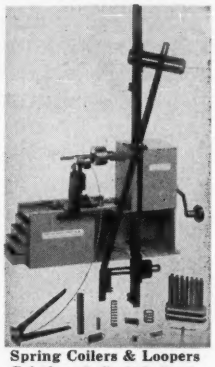
The aluminum-silicon base alloys are easy to use and to maintain. The superior coatings which result have led to almost universal acceptance in continuous processes. Because silicon inhibits diffusion between aluminum and iron, its use allows a flexibility in coating temperatures and speeds that is not usually obtained with commercially pure aluminum.

Comparison of Aluminizing and Galvanizing

The processes of aluminizing and galvanizing are similar in many respects. Economically, little can be said about aluminizing because cost data are not available. Aluminizing temperatures are higher, in the range of 1200 to 1400F, so that operating costs and equipment first costs are probably greater. However, aluminum is less costly and exhibits longer service life than zinc for an equal thickness of coating.

★ ★ ★

Galvanized wire may be drawn to strength prior to coating. Alu-


Spring Coilers & Loopers
Grinders & Carbide Tools

SPRING MACHINES

For coiling Compression, Extension and Torsion springs. Ideal for making samples and small lots up to 1000 quickly and accurately.

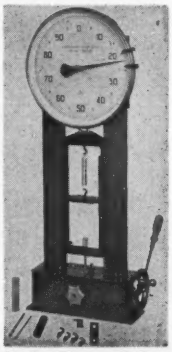
Available in two sizes.

For testing loads and deflections of Compression and Extension springs.

Available in four capacities: 25, 100, 200 and 300 lbs.

Write for prices and bulletins.

THE CARLSON COMPANY
277 Broadway, New York 7, N. Y.
Phone BArclay 7-2552


Spring Testers & Ovens
Electronic Gauging

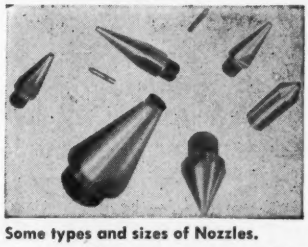
LOFTUS ENGINEERING CORPORATION

Designers and Builders of
Industrial Furnaces for
Ferrous and Non-Ferrous Materials

610 Smithfield Street — Pittsburgh 22, Pa.

REELS and SPOOLS
ALL SIZES
WOOD - PLYWOOD - WOOD - METAL
RETURNABLE • TO ORDER • NON-RETURNABLE
Samples and Prices on Request
DURKEE MFG. CO., INC. — PINE RIVER, MINN.

Get High EXTRUSION PRODUCTION
with CARBIDE NOZZLES
(made for all makes of *Extruders* for electric wire)

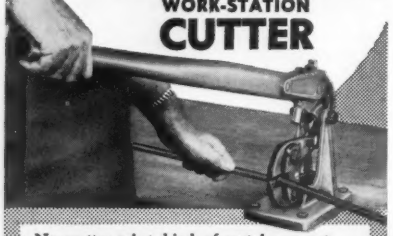

Some types and sizes of Nozzles.

One major Electric Wire and Cable concern has produced over 40 MILLION FEET of electric wire with one of our NOZZLES.

Our nozzles will save you money!

You, too, can enjoy these savings. Write or call
WIRE TOOL DIVISION
BRIDGEPORT JIG BORING COMPANY
303 STRATFORD AVE., BRIDGEPORT, CONN. TEL.: FOREST 7-8473

Increase- HIS
METAL CUTTING POTENTIAL
Decrease- YOUR
METAL CUTTING COSTS
WITH THE NEW PORTER
WORK-STATION
CUTTER



No matter what kind of metal you cut — wire, rods, wire rope, cable or any other kind, you can save valuable man hours in your metal cutting operations with the rugged new Porter Work-Station Cutter. Can be fastened to work station welding unit or bolted to a plank and used as a portable cutter. Available in a variety of types of cutter heads for specific requirements. Notched Shear heads for cutting wire rope or cable — Center Cut heads for cutting copper, brass, aluminum, soft steel rods or wire — Center Cut round edge for hard spring wire, etc.
Available in two sizes:
1B cuts wire and cable up to 3/8" diameter.
3B cuts wire and cable up to 9/16" diameter.

Send us sample of metal to be cut and we will advise proper type of jaws required. HKP®

WRITE FOR FREE PORTER CUTTER CATALOG
H. K. PORTER, INC. Somerville 43, Mass.

minimized wire, which is annealed during coating, requires redrawing to regain high strength. An example of the properties obtained on as-coated, redrawn and stress relieved high carbon steel wire is shown in Table II. Sometimes,

TABLE II

TENSILE STRENGTH AND ELONATION OF ALUMINIZED 0.60% C STEEL WIRE

Treatment	UTS(psi)	% Elong. in 10 Inches
As-coated	197,000	15
Redrawn 54%	204,000	1.5
Strand Annealed in lead 900F, 5 sec	204,000	4.5
Stress relieved 400F 5 hr. in air furnace	200,000	4.0

however, annealed wire is desired, and the simultaneous annealing and coating operations achieved in aluminizing reduce the cost, as compared to annealing drawn wire prior to galvanizing. The nature of the aluminum coating process indicates that high carbon steel wire may also be patented by coating at temperatures above the critical, followed by air cooling. One may conclude that under proper conditions of coating, aluminizing and galvanizing costs will be comparable and competitive, par-

SMALL WOOD SPOOLS
for
WIRE

Range of Sizes:
1" long with 5/8" head diam.
up to
3½" long with 2⅛" head diam.

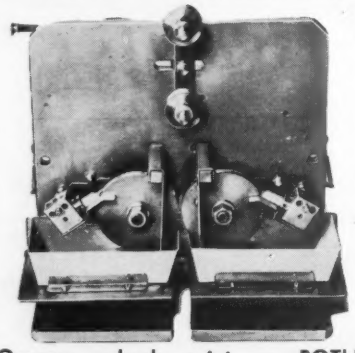
Supplied stained in any color according to your needs.
Special finishes to order.

"NOWASCO" WOOD SPOOLS are used by many wire manufacturers for wire prepared for retail sale.

Write for samples and prices.

NORTH WATERFORD SPOOL CO.
P.O. Box W
North Waterford, Maine
Tel.: Harrison JUstice 3-2321
1918-1956

MARKING WHEELS and
MACHINES for ELECTRIC WIRE

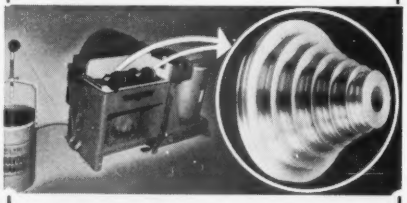


Concave wheels print on BOTH SIDES of the wire for code identification or manufacturer's name in large, legible type.
Ink pans, wheels and parts easily removed for wheel changes and cleaning. Vernier controls.

Samples and prices sent upon request

DUNCAN M. GILLIES CO., INC.
P.O. BOX 181, WEST BOYLSTON, MASS.
Telephone: West Boylston TE 5-4445
ENGRAVERS OF FINE MARKING WHEELS FOR THE ELECTRIC WIRE INDUSTRY

4 TIMES THE LIFE
OF YOUR
MACHINE WEAR PARTS
GUARANTEED
BY
CHROMIUM PLATING



WIRE DRAWING CARRIERS, GUIDES, SHEAVES, SHAFTS, CAPSTANS, NIPPLES, CAMS, WIRE STRAIGHTENERS etc.

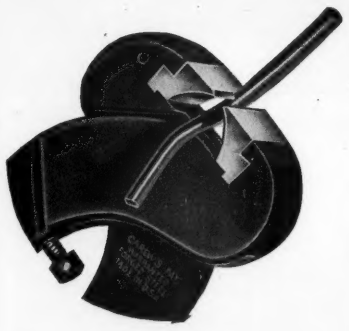
City Plating Works, Inc.
66-80 PINE STREET
BRIDGEPORT 5, CONN.
TEL. FOrest 6-4718

Specify
Warner
BELL-MINE
LIME
PRODUCTS

Laboratory quality control assures dependability for wire drawing

- Pulverized Quick Lime
- Hydrated Lime
- Pebble Lime

WARNER COMPANY
Sales Offices
BELLEFONTE PHILADELPHIA
PITTSBURGH NEW YORK



QUALITY

You'll find proof of this in every "CAREW" Cutting Nipper. Since 1863 every "CAREW" has been the product of superior materials and painstaking workmanship. Intrinsic QUALITY underlies the overall efficiency, operating ease, and production economies you get with every "CAREW" Cutter.

STOCKED BY YOUR LOCAL MILL SUPPLY DEALER.

M. W. ROBINSON CO., INC.
ROCKFALL, CONN.

ticularly when the appearance and performance of aluminized wire are considered.

★ ★ ★

Wire products are now commercially available, and announcements of new producers entering the field are seen with increasing frequency. It is anticipated that continued demonstrations of superior performance by high quality aluminized wire will encourage more producers to enter the field and to develop suitable processes which will be profitable to the steel and aluminum industries as well as to the consumer.

REFERENCES

1. U. R. Evans, Chemistry and Industry, March 24, 1956, p. 195.
2. M. J. Pryor, D. S. Keir, Journal Electrochemical Society, In the Press.
3. T. Sendzimir, U. S. Patent, 2,110,893, March 15, 1938.
4. G. A. Moller, U. S. Patent 2,315,725, April 6, 1943.
5. Technical Briefs, Iron Age, February 24, 1955.
6. M. L. Hughes and D. P. Moses, Hot Dip Aluminizing, Metallurgia, 48, 287, pp 105-122, September 1953.
7. D. O. Gittings, D. H. Rowland and J. O. Mack, Trans. ASM, 1951, XLIII, 587.
8. D. K. Hanink and A. L. Boegehold, Coating Steel by the Aldip Process, Society of Automotive Engineers Reprint, January 12, 1953.

HIGH QUALITY, GRADED
DIAMOND POWDERS

Are Essential to Efficient Production. You Can Always Depend on NATIONAL Quality.

- DIAMOND POWDERS—Complete line of graded quality powders for all lapping and finishing operations on wire drawing dies. First grades only.
- DIAMOND POWDER RECLAMATION — Exclusive process that gives maximum recovery. Send us your old cotton, die washings, worn wheels and sludge. High salvage percentages will pay you well.
- DIAMOND GRINDING WHEELS—A complete line of top-quality wheels for industrial production.

Write for prices.

NATIONAL RESEARCH COMPANY
25530 LITTLE MACK AVE.
ST. CLAIR SHORES, MICH.

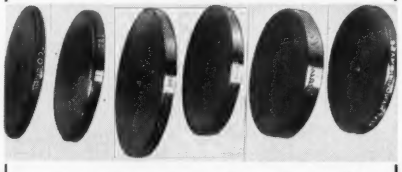
WEMCO MOLTEN METAL PUMP

Air Driven for Rapid Transfer of
ZINC
LEAD
ALUMINUM
TIN
THEIR ALLOYS
and
HEAT TREATING SALTS

WIRE EQUIPMENT MFG. CO., INC.
1168 So. Olden Ave.
Trenton 10, N. J.

EXPORT AGENTS:
FISHER ASSOCIATES
122 E. 42nd Street
New York 17, N. Y.

GEM GRAVURE CO.
SCHOOL ST. WEST HANOVER, MASS.
MARKING
WHEELS • INKS • MACHINES



1 2 3 4 5 6

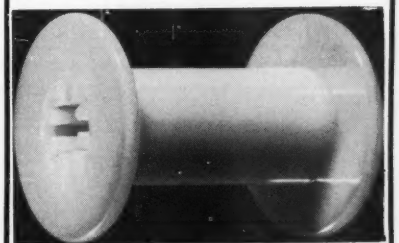
1—Embossing, 2—Special, 3—1' Marker, 4—.300" Flat, 5—.437" Flat, 6—Concave.

★ Perfect definition of type or trade mark at speeds up to 2400 ft./min.
★ Three times wiper life.
★ Marks on hot or cold plastic, rubber or glass braid.
★ Photo-engraved on hardened tool steel, industrial hard chrome plated.
★ Six to ten year life.

In the marking of extruded material there are BIG advantages in ONE single source of supply for: KNOW HOW, INKS, WHEELS and MACHINES.

Rockland, Mass. TRiangle 7-0456

BRAIDER SPOOLS
THAT CAN TAKE IT!
PLAMENCO WIRE SPOOLS
are precision molded of DuPont's Zytel Nylon for more uniform and accurate put-up.

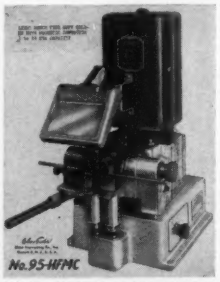


PLAMENCO SPOOLS won't:
- Break when dropped.
- Distort under load.

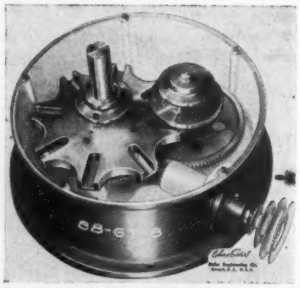
Durable and Economical

Get the facts
NYLACLAD-PLAMENCO DIV.
PLASTIC MOLD & ENGINEERING CO.
157 Clifford St. • Providence, R. I.

EISLER SPOT AND BUTT WELDERS FOR
THE WIRE INDUSTRY
A WELDER FOR EVERY PURPOSE



Eisler Indexing Turntables over 100 different types Geneva Gears-Cams made to your specifications. Write for catalog.



EISLER ENGINEERING CO., INC.
CHARLES EISLER, Jr., Pres
747 South 13th St. Newark 3, N. J.

Electromatic Oil Tempered Wire

(*Continued from page* 1159)

small amounts of zirconium added to the lower manganese heats gave complete hardening in 5/16″ wire, the largest size currently produced at Aliquippa. Better over-all yield was realized since sensitive high manganese heats were no longer in the picture. The zirconium apparently acts as a scavenger tying up the inherent nitrides, oxides, and sulfides in addition to improving hardenability. Figure 13 is a photomicrograph of oil tempered wire with zirconium. The cubical crystals are zirconium compounds. When viewed under the microscope these appear as a golden yellow color.

★ ★ ★

Another attractive feature with the use of zirconium is a cost savings at the steel works. Additions are made as a ferro-alloy containing a high percentage of silicon. Less ferromanganese and no ferrosilicon additions are made in a heat of this type. The added cost of the zirconium addition is more than offset with savings in other additions.

★ ★ ★

At present, all wire sizes over .200″ are being produced with zirconium bearing heats. Smaller sizes can be made without difficulty. Size limitation is maintained in line with wire mill practices to prevent use of this high hardening steel where excessive hardness might be undesirable.

★ ★ ★

No great change in physical properties has been noted with the use of zirconium. A slight drop in ratio of yield strength to tensile strength is apparent. This ratio still is as high or higher than conventionally tempered material.

V
Summary

In the use of the Trauwood unit we have an electrical resistance heating cycle and an arrested quenching cycle for producing oil tempered wire as in contrast with conventional units where wire is

Announcement

L. O. BURRELL CO.
INC.
BUFFALO 6, N. Y.

HAS PURCHASED

R. J. WATTERS CO.
INC.

And is offering the following Pickling Chemicals for Sale.

KLEANRITE
Pickling Compound
INHIBITE-RITE Inhibitors
SURF-KLEAN • FOAMRITE
Other Pickling Chemicals

Pickling Consultants Since 1913

WAYNE WIRE DRAWING DIES

Quality in Diamonds + Perfection in
Workmanship = Good Wire

Satisfactory DIAMOND DIES can only be made by those who have experience, skill and knowledge. WAYNE has all of these. Users have called WAYNE DIES "the best."

WAYNE WIRE DIE CO., 200 Pennsylvania Ave., Hillside, N. J.
Telephone: Elizabeth 2-2456

TUNGSTEN CARBIDE WIRE DRAWING DIES

DESIGNED FOR LONG LIFE AND MAXIMUM WIRE PRODUCTION

Furnished semi-finished to within .001″ to .002″ of finished size at rough-drilled die prices. Require only light sizing and polishing before using. Our dies embody special design features that make for superior performance.

Also, a full line of carbide tooling for the Cold Heading Industry

EASTERN CARBIDE CORPORATION
NEW ROCHELLE, N. Y.

austenitized directly in a heating medium and quenched directly in oil. This electromatic process produces a finer grained, tougher microstructure with high physical properties. To achieve the maximum benefits from the rapid heating cycle of this process, we prepare the stock by patenting and drawing. By close control of chemistry and use of zirconium additions for larger sizes, a higher quality oil tempered wire is being produced.

Spiral Wrapping Machines and Materials

(*Continued from page* 1212)

Large labels are now coming to the front in various mills bearing type and size spaces, as well as a large space for the manufacturer's trade-mark. In a few instances, printed papers are being used that have the message printed continuously on the spiral wrap paper.

★ ★ ★

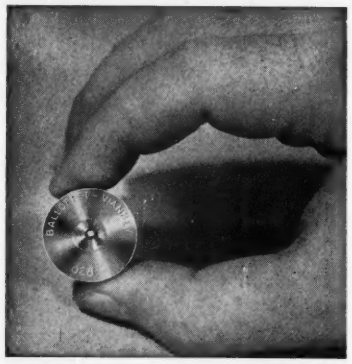
Here are a few essential points that should be followed in spiral wrapping:

1. **Overlap** on any coil should be 50%. If 5" wide paper is used, there should be a 2-½" lead. If a single fold is used on each side, this fold should be ¼" on each side. This would narrow the paper to 4-½" on a 5" sheet and the lead should be 2-¼".

★ ★ ★

2. **The** secret of the spiral wrap with krinkled paper is the tightness after it has been applied. Krinkled paper in rolls should have about 20% stretch. In its application, 15% of this stretch should be

BALLOFFET VIANNEY WIRE DIE CO., Inc.



All sizes from .081" down to .0004" in stock from New York.

Manufacturers of Quality diamond dies since 1870

BALLOFFET VIANNEY WIRE DIE CO., Inc.
6825 ADAMS ST., GUTTENBERG, N. J.
Tel: Union 3-3393

DIAMOND
and
TUNGSTEN CARBIDE
DIES
for all WIRE DRAWING purposes.
SPECIALISTS IN DIE REPAIR WORK ON ALL TYPES OF DIES.
UNIVERSAL WIRE DIE CO.
951 Lincoln Ave., Cranford, N. J.
CRanford 6-0116

UNION WIRE DIE CORP.
71 West 45th Street • New York 36, N. Y.
Main Plant: 375 Fairfield Ave., Stamford, Conn.
• DIAMOND DIES
• ROUND TUNGSTEN CARBIDE DIES
• SHAPE TUNGSTEN CARBIDE DIES
• HEADER DIES & MANDRELS
• CARBIDE SPECIALTIES
• DIAMOND POWDER
• UNILAP-TC DIAMOND COMPOUNDS
• INDUSTRIAL DIAMONDS
• DIAMOND RECLAMATION SERVICE
• DIE RECUTTING SERVICE
• DIE ROOM MACHINERY
UNIVIC UNIWIDE
• • • Serving the wire drawing industry for 35 years as the ONLY manufacturer of ALL products and services for the die room.

DIAMOND DIES .0006 - .120 DIAMOND POWDER
INDUSTRIAL AJAX SUPPLIES INC.
R.R. 4, P. O. Box 66, Fort Wayne, Ind.

NEW ENGLAND WIRE DIE CO.
7 Forsberg St., Worcester, Mass.
EXPERT RECUTTING
DIAMOND DIES, DIAMOND POWDERS
Eastern Representative of
Ajax Industrial Supplies, Inc.

DIAMOND DIES
PROFILED DIES
FINE SIZE DIES
VICTOR J. BOULIN INC.
10 FIRST STREET, PELHAM, N. Y.

DIAMOND POWDERS
Expert Reclaiming Service
MOLINA-STRAUS
DIAMOND PRODUCTS COMPANY
527 Fifth Ave., New York 17, N. Y.
Tel.: MUrray Hill 7-6825

"NATDI"
A REVERSIBLE DIAMOND DIE
GREATER INITIAL PRODUCTION
MORE RECUTS — LONGER LIFE
NATIONAL WIRE DIE CO.
30 IRVING PLACE, NEW YORK 3, N. Y.

DIAMOND WIRE DRAWING DIES
and DIAMOND POWDER
INDIANA WIRE DIE COMPANY
314-324 E. Wallace St., Fort Wayne, Indiana
Phone: Harrison 4373

DIAMOND DIES CARBIDE
KELLY
WIRE DIE CORPORATION
19 W. 34th St. New York

DIAMOND DIES
.000's to .102"
For many years . . .
Outstanding in quality, workmanship and service.
FORT WAYNE WIRE DIE, INC.
2625 E. Pontiac St., Fort Wayne, Ind.

DIAMOND WIRE DRAWING DIES
DIAMOND POWDER AND COMPOUNDS
DIE RECUTTING SERVICE
CARBIDE DIES • TOOLS • PARTS
RUSCH WIRE DIE CORPORATION
CROTON-ON-HUDSON, N. Y.

DIAMOND POWDER
Diamond Reclaiming Services
FORT WAYNE DIAMOND PRODUCTS, Inc.
2623 E. Pontiac Fort Wayne 5, Indiana

CARBIDE NAIL TOOLING
for
Glader—National-Wikschtrom Nail Machines
PITTSBURGH CARBIDE DIE CO.
Monongahela, Penna. BLackburn 8-6959

DIAMOND DIES
mounted unmounted
For Precision Wire Drawing
BRENON, INC.
Experts in Fine Size Diamond Dies
R.F.D. #5, Box 400, New Brunswick, N. J.

PINS and POINTED WIRE PRODUCTS
Manufactured by LOW COST — HIGH VOLUME production methods . . BRASS · STAINLESS · CARBON · MONEL · STEEL · HEAT TREATED AND POLISHED
Short Taper • Long Taper • Needle and Blunt Pointing, Double Pointing, Heading, Applied to Various Lengths and Diameters
Send samples or B/P for quotations
ROBERT A. MAIN & SONS INC.
305 PASCACK ROAD PARAMUS, NEW JERSEY

WORK WITH WEBB
for finer quality wire
Stainless • Needle • Nickel Alloy
WEBB WIRE
DIVISION OF THE CARPENTER STEEL CO.
NEW BRUNSWICK, N. J.

WIRE DRAWING MACHINERY AND EQUIPMENT
Rod Frames — 16" Frames, 8" Frames — Take-Up Frame, Wire — Pointers — Puller Tongs — General and heat resisting alloy castings for wire mill use.
Circulars on Request
E. J. SCUDDER FOUNDRY & MACHINE CO.
TRENTON, N. J.

METALLIZING WIRE
PURE ZINC
PURE CADMIUM
Other Fine Bare Wires
Manufactured to Your Specifications.
IMMEDIATE DELIVERIES
STAMFORD PROCESSING CO.
10-24 S. Water St., Peekskill, N. Y.

pulled out so that **only** 5% remains on the wrapped coil. This is enough to allow the coil to flex without breaking the paper. Any more than this will make for a loose wrap that will slide on the coil, leaving parts of the coil exposed.

★ ★ ★

3. **One** of the best safeguards to a right package is a periphery strip of paper around the periphery of the coil under the spiral wrap. This can readily be applied by the wrapping machine while the coil is being spirally wrapped. It will prevent slippage of the spiral wrap, it will cover wire knots on the wire cross ties that tend to cut through the paper and if an adhesive is used, it will "anchor" each spiral in definite position.

★ ★ ★

4. A rip cord should be inserted under the wrap to rip the entire paper from the coil. Worcester Wire Works manufactures and sells a very in-expensive "knurled rip wire" that readily bares the coil with a slight pull. This rip wire is designed to cut through most any weight paper and will cut through paper having nylon insertions.

★ ★ ★

A few words on materials being used. 30/30/30 krinkled is used to the largest extent. This sheet consists of two sheets of 30# paper, laminated with 30# of asphalt. If the paper is of sufficient tensile strength, it can be used on coils up to 500#. But the strength in machine direction and the cross tear strength is absolutely essential. The highest grade #1 Northern Kraft is best.

★ ★ ★

Wax or polyethylene laminates are being used in specific cases when the object wrapped attacks the asphalt. This is premium paper at a premium price and should only be used when absolutely necessary.

★ ★ ★

Krinkled kraft papers of 80#

SLEEPER & HARTLEY, Inc.
Designers and Builders
SPRING COILERS
WIRE WORKING MACHINERY
WIRE MILL EQUIPMENT
SPECIAL MACHINERY
Address Inquiries to
Box 1249
WORCESTER, MASS.

STRAND-BUFFALO CORP.
No. Tonawanda, N. Y. (near Buffalo)
REELS
WOOD and PLYWOOD
Manufactured to Your Specifications

WIRE ROPE TOOLS for SERVING, SEIZING and BANDING.
SUBCONTRACTORS for WIRE ROPE SLINGS.
S. W. ELLIOT AND SON
1257 Jordan Ave., Montoursville, Pa.

WORLD'S LARGEST MANUFACTURER
SPIRAL WRAPPING MACHINES
For Coils or Straight Lengths
Terkelsen Machine Company
323 A Street, Boston 10

WOOD REELS and SPOOLS
American Woodworking Company
1" to 60" Diameters. Send $1.00 for our catalogue of all wood products made in the U.S.A.
1674 N. Lowell Avenue
Chicago 39, Illinois

ZINC WIRE
THE PLATT BROS. & CO.
Waterbury 20, CONN.

Immediately Available
WIRE WORKING MACHINERY.
FOURSLIDES: Baird, Nilson & Manville, Nos. 0, 1, 2, 3, 4, 5, 3-20, 4-26
U. S. Tool Co. No. 22, 28, & 33 Multislides
Sleeper & Hartley Spring Coilers Nos. 0, 1, 2, 3, 3½, 4, & 5
Vaughn Nos. 8, 10, & 12 Moto-Blocs
Waterbury No. 3 Bull Blocks, Duplex
Morgan 4 stand Wire Drawer with pointer and 100 H.P. motor drive & motor
Waterbury Nos. 1, 2, & 3 Continuous Wire Drawing Machines
PARTIAL STOCK LISTING
"The most diversified stock of machinery in the country. If it's machinery we have it."
National Machinery Exchange
130 Mott St., New York 13, N. Y.
CAnal 6-2470

and 60# weights are being used and their uses are now increasing rapidly. The #1 Northern sheet is of golden brown and the 80# weight is of sufficient strength for most all wire coils. It is much less in cost than the wax or poly laminates and in 90% of cases, answers the same purpose.

★ ★ ★

Nylon and rayon re-enforced papers are used for boat shipments, long haul and many transfer truck shipments. This is two sheets of 30# kraft laminated with 30# of asphalt. The re-enforcement of nylon or rayon is run lengthwise on the asphalt. Spacings are either 3/8", 1/2" or 3/4" and when properly applied, it will withstand most all of the ravages of transportation.

★ ★ ★

Vapor phase inhibitor papers are now being used to a limited degree but in most cases, as a periphery strip under the spiral wrap. This paper can now be supplied with the full 20% krinkle so that it may be used successfully as a spiral wrap. However, the cost is rather high in comparison to other materials.

★ ★ ★

45# and 30# papers are used to a limited degree. These papers being of light weight are used mostly when the coil is shipped in a container.

★ ★ ★

Burly backed papers, 7½ ounces and 10 ounces burlap laminated with asphalt to a kraft paper, are used on export shipments to a small degree but high cost has limited the use. Nylon re-enforced papers have supplemented burlap backed in most instances.

★ ★ ★

Cellophane is being used successfully as an under wrap and may be applied by machine. Celanese has a polyethylene film that is being used. This film has a large degree of stretch. DuPont's "Mylar" laminated to kraft is being introduced, but at the moment is much too costly for most spiral wrapping.

Engineering and Professional Services

CONSULTING WIRE MILL ENGINEER
Specializing in Wire Mill Machinery, Plant Layout and Production Techniques.
CLARENCE S. ARMS
Sleeper & Hartley, Incorporated
P.O. Box 1249 • Worcester, Mass.

LINE—GORCY
mechanical
wire rod descalers
FISHER ASSOCIATES
122 East 42nd St. New York 17, N. Y.

LANCASTER, ALLWINE & ROMMEL
REGISTERED PATENT ATTORNEYS
Suite 438, 815—15th St., N. W.
Washington 5, D. C.
•
Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request.

WANTED TO PURCHASE
Artos Strippers
48 Carrier Wire Braider
Reply to Box 877
WIRE AND WIRE PRODUCTS
453 MAIN STREET, STAMFORD, CONN.

WANTED:
Plant foreman for non-metallic cable plant, familiar with Wardwell Braiders and Finish Processes. Apply to:
R. P. Schofield, Jr.
ATLAS WIRE & CABLE COMPANY
P. O. Box 123, Florence, S. C.
Phone — 6370
Give all details in first letter as to age, experience, education, etc.

WANTED
PROJECT AND SALES ENGINEER
An aggressive and well established young company manufacturing equipment for the magnet and film insulated wire industry has opening for a young engineer with experience in the wire field. Permanent position and growth for right man. Should be adaptable to sales work. Midwest location.
Salary commensurate with ability. Write fully: age, experience, qualifications etc. Replies confidential — Our employees know of this ad.
Box 879
WIRE & WIRE PRODUCTS
453 Main St., Stamford, Conn.

EXTRA COPIES OF THE
BUYERS' GUIDE
AVAILABLE FOR $5.00 EACH

FOR SALE
1 new Chain Link Fence Machine, Twin Spiral Automatic, Width of netting 12 feet, With netting outfit for 1" 2" 3"
Immediately available
Box 880
WIRE & WIRE PRODUCTS
453 MAIN STREET STAMFORD, CONN.

WANTED: WIRE AND CABLE SALES ENGINEER—Manufacturer of magnet wire, aircraft wire, stranded lead-wire, plastic wire and harnesses, located in Midwest, has excellent opportunity open for engineer experienced in part or all of those categories, to do liaison work with customers' engineers, cooperating with salesmen. Travelling on an unscheduled basis is required. This is a permanent position, with hospitalization, group insurance and pension plan, all company-paid. Salary open. Reply by letter giving full details of age, education, experience, qualifications. Replies will be held confidential—our employees know of this ad.
Box 878
WIRE & WIRE PRODUCTS
Stamford Conn.

Index to Advertisers

A

Acrometal Products, Inc. 1168-1169
Ajax Electric Company 1241
Ajax Engineering Corp. 1129
Ajax Industrial Supplies, Inc. 1279
Ajax Manufacturing Company, The 1066
Allis, Louis Co., The 1122
Alloy Metal Wire Div., H. K. Porter Co., Inc. 1231
Aluminum Company of America 1151
American Brass Company, The 1270
American Chemical Paint Company 1105
American Insulating Machinery Company 1072-1073
American Lanolin Corp. 1274
American Laubscher Corp. 1132
American Leonic Manufacturing Co. 1240
American Pulley Company 1112
American Steel & Wire Div., U. S. Steel Corp. 1141
American Woodworking Company 1280
Apco Mossberg Company 1070
Apex Alkali Products Co. 1208-1209
Arkell Safety Bag Company 1075
Arms, Clarence S. 1281

B

Baird Machine Co., The 1109
Balloffet-Vianney Wire Die Co., Inc. 1279
Bethlehem Steel Company 1074
Bick, Hans C., Inc. 1069
Boulin, Victor J., Inc. 1279
Brenon Inc. 1280
Bridge Mfg. Company 1083
Burdwood, Howard A. Inc. 1261
Burrell, L. O. Co., Inc. 1278

C

Camden Wire Co., Inc. 1237
Carl Mayer Corp., The 1262
Carlson Company, The 1275
Carpenter Steel Co., Webb Wire Div. 1280
Carris Reels, Inc. 1234-1235
Carter & Co. Ltd., B. & F. 1269
Catalytic Combustion Corporation 1257
Cedar-West Tool Company, Inc. 1071
Chase Brass & Copper Co. 1079
Chemo Textiles Inc. 1258
City Plating Works Inc. 1276
Clark Mfg. Co., J. L. 1078
Cleveland Tramrail Division of
The Cleveland Crane & Engineering Co. 1084
Colbourne Machine Co. 1250
Colorado Fuel & Iron Corp., Wickwire Spencer Div. 1196-1107
Continental Can Company ..... Inside Front Cover
Continental Steel Corporation 1230
Cook Manufacturing Co. 1104
Coulter & McKenzie Machine Co., Inc., The 1221
Crucible Steel Company of America 1067

D

Danforth, C. W. Company 1261
Davis Electric Co. 1098
Davis-Standard Sales Corporation 1080-B
DuPont de Nemours & Co., (Inc.,) E. I., Polychemicals Dept. ... 1099
Durant Manufacturing Co. 1272
Durkee Manufacturing Co., Inc. 1275
Dykrex Corporation 1271

E

Eastern Carbide Corporation 1278
Edmands Co., The 1267
Eisler Engineering Co., Inc. 1278
Electric Furnace Company, The ..... Back Cover
Electronic Rubber Company 1257
Elgin National Watch Co., Abrasives Div. 1196
Elliott & Son, S. W. 1280
Emory, Robert J. Company 1268
Engis Equipment Co., Hyprez Division 1097
Entwistle, James L. Co. 1255
Entwistle Manufacturing Corporation 1127
E. V. G.—Maschinen & Stahl, A. G. 1100

F

Federal Manufacturing Co. 1108
Fenn Manufacturing Co. 1233
Firth Sterling, Inc. 1092
Fisher Associates 1281
Fort Wayne Diamond Products, Inc. 1280
Fort Wayne Wire Die, Inc. 1279

G

Gas Machinery Company, The 1093
Gem Gravure Co. 1277
General Electric Co., Alkanex Wire Enamel Div. 1113
Gillies, Duncan M. Co., Inc. 1276
Glader, William Machine Works 1203

H

Haskell-Dawes Machine Company 1263
Heany Industrial Ceramics Corp. 1243
Herborn Maschinenfabrik 1120-1121
Hercules Filter Corporation 1089
Hobbs Mfg. Co. 1262
Howsam Spool Company 1095
Hubbard Spool Co. 1136-1137

I

Indiana Wire Die Company 1279
Industrial Gauges Corporation 1114
Industrial Ovens, Inc. 1228
Interlocking Fence Co. 1252
International Fine Wire Co., Inc. 1116
Ironsides Company, The 1263

J

Jarke Manufacturing Company 1264
Jones & Laughlin Steel Corporation 1085
Johnson Steel & Wire Co., Inc., Div. of
Pittsburgh Steel Company 1110-1111

K

Kellogg, M. W. Company, The ..... 1149 & 1272
Kelloy Corporation 1101
Kelly Wire Die Corporation 1279
Keystone Steel & Wire Company 1128-A
King, Alfred B., Co. 1240

L

Laclede Steel Company 1094
Lancaster, Allwine & Rommel 1281
Larmuth (1947) L'd. 1265
Lewis Machine Company, The 1125
Litzler, C. A. Co., Inc. 1232
Loftus Engineering Corporation 1275

M

Magnuson Products Corporation 1260
Main & Sons, Inc., Robert A. 1280
Malin & Company, The 1273
Maschinen & Stahl, A. G.—E. V. G. 1100
Mason Can Company 1248
McCaskie, Inc., Wm. 1274
McKay Machine Company, The 1144-1145
McLaurin-Angier Co. 1076
Metal & Thermit Corporation 1246
Metal Carbides Corporation 1081
Metallurgical Products Dept. of G. E. 1150
Mettler Machine Company, Inc. 1103
Michigan Oven Company 1088
Micro Products Company 1102
Miller, R. H., Company, Inc. 1154
Milton Machine Works, Inc. 1273
Molina-Straus Diamond Products Company 1279
Monsanto Chemical Company 1124
Montgomery Company, The 1090
Morgan Construction Company ..... 1112 A & B
Mossberg Pressed Steel Corporation 1128-B

N

National Annealing Box Company 1273
National Lock Washer Company, The 1115
National Machinery Exchange 1280
National Research Co. 1277
National Standard Company 1096
National Waterproof Papers, Inc. 1265
National Wire Die Company 1279
Naugatuck Chemical Div., United States Rubber Co. 1133
Nelson Company, The 1252
Nesor Alloy Products Co. 1253
New England Butt Company 1176-1177
New England Wire Die Co. 1279
New York Engineering Company 1236
Nichols Wire & Aluminum Co. 1077
Nilson Machine Co., A. H. 1245
North Anson Reel Co. 1130
North Waterford Spool Co. 1276
Norton Company 1249
Nukem Products Corporation 1117

O

Overlakes Corporation, Garfield Wire Div. 1254

P

Parkin Chemical Company, The 1266
Patterson Machine Co., The, George C. 1266
Pennsylvania Salt Mfg. Company 1118
Peschel Electronics, Inc. 1269
Pittsburgh Carbide Die Co. 1280
Pittsburgh Steel Company, Johnson Steel & Wire Co., Div. 1110-1111
Plandex Corporation 1271
Plastic Mold & Engineering Co. 1277
Platt Brothers & Co., The 1280
Plymouth Cordage Company 1244
Porter, Inc., H. K. 1276
Pourtier Pere et Fils 1250
Prodex Corporation 1260

R

Republic Steel Corporation, Pressed Steel Div. 1131
Richards Company, J. A. 1256
Robinson Co., Inc., M. W. 1277
Rockwell Company, W. S. 1247
Rods, Inc. 1274
Roebling's Sons Corp., John A. 1080-A
Rome Soap Manufacturing Company 1264
Root, B. M. Co. 1239
Royle & Sons, John 1142
Rusch Wire Die Corporation 1280

S

Scott Testers, Inc. 1268
Scovill Manufacturing Company 1138
Scudder Foundry & Machine Co., E. J. 1289
Shawinigan Resins Corporation 1119
Sheffield Steel Div., Armco Steel Corporation 1251
Sjogren Tool & Machine Co., Inc. 1068
Sleeper & Hartley, Inc. 1280
Stamford Processing Co., Inc. 1280
Standard Electronic Research Corp. 1135
Standard Industrial Compounds Co., Inc. 1065
Standard Mill Supply Company 1238
Strand-Buffalo Corp. 1280
Superior Tool & Mfg. Co. 1274
Swift & Company 1086
Syncro Machine Company 1188-1189

T

Terkelsen Machine Company 1280
Torrington Mfg. Co., The 1091
Trauwood Engineering Company, The 1087
Twitchell, E. W., Inc. 1139

U

United States Borax & Chemical Corporation, Pacific Coast Borax Company Div. 1270
United States Industrial Chemicals Co., Div. of National Distillers Products Corp. 1148
United States Rubber Co., Naugatuck Chemical Div. 1133
United States Steel Corp., American Steel & Wire Div. 1141
United Wire & Supply Corp. 1229
Union Wire Die Corp. 1279
Universal Wire Die Co. 1279
Universal Industrial Equipment Co. 1254

V

Vascoloy-Ramet Corporation 1152
Vaughn Machinery Company, The ..... Front Cover & 1192-A-B-C-D
Volco Brass & Copper Company 1134

W

Wafios Maschinenfabrik 1126
Wardwell Braiding Machine Co. 1146
Warner Company 1276
Waterbury-Farrel Foundry & Machine Co. ..... 1080 & 1140
Watson Machine Company ..... Inside Back Cover
Wayne Wire Die Co. 1278
Wells, Frank L. Company 1242
Wickwire Brothers, Inc. 1273
Wilson, Lee Engineering Co., Inc. 1143
Wire & Textile Machinery Inc. 1082
Wire Insulating Machinery, Inc. 1259
Wire Equipment Manufacturing Co., Inc. 1277
Wire Tool Division, Bridgeport Jig Boring Company 1275

Y

Youngstown Sheet & Tube Company, The 1123
Youngstown Welding & Engineering Co., The 1147

WHERE TO BUY

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.
Only advertisers who have contracted for six or more insertions are listed in this section.

ABRASIVES—
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Norton Co., Worcester, Mass.

ACID INHIBITORS—
(See Inhibitors, Pickling)

ADJUSTABLE SPEED DRIVES
The Louis Allis Company, Milwaukee, Wisc.

ANNEALING MACHINES — Electric Resistance
Synerc Machine Co., Perth Amboy, N. J.

ANNEALING POTS AND BOXES—
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.

BAKERS—
(See OVENS—Rod Bakers)

BOBBINS—Braider & Wire Weaving
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Carter & Co., Ltd., B. & F., Bolton, England.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Plastic Mold & Engineering Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc (used) Pawtucket. R. I.

BORAX—Wire Drawing
United States Borax & Chemical Corp., Pacific Coast Borax Co. Div., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CABLE FILLERS—Paper
Plymouth Cordage Company, Plymouth, Mass.

CAPSTANS—for Wire
Litzler, C.A., Co., Inc., Cleveland, Ohio.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Carter & Co., Ltd., B. & F., Bolton, England.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket. R. I.

CASTINGS—Wire Mill
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Parkin Chemical Co., The, Pittsburgh, Pa.
Rome Soap Manufacturing Co., Rome, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.

CLEANING & PICKLING EQUIP.—
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee Engr. Co., Cleveland, Ohio
Youngstown Welding & Eng'g Co., Youngstown, Ohio.

CLOTH—WIRE, All Metals
Baker, James S., (Imports) Co., 311 California St., San Francisco, Calif.
Chase Brass & Copper Co., Waterbury, Conn.
Wickwire Bros., Cortland, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y
Pennsylvania Salt Mfg. Company, Philadelphia, Pa.
Standard Industrial Compounds Co., Frankfort, Ill.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.
Miller, R. H. Co., Inc., Homer, N. Y.

COMPOUNDS—Diamond (Pre-Mixed)
Eastern Carbide Corp., New Rochelle, N. Y.
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago.
Rusch Wire Die Corporation, Croton-on-Hudson, N. Y.
Union Wire Die Corp., New York, N. Y.

COMPOUNDS—Extrusion, for Wire
Electronic Rubber Co., Stamford, Conn.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
U. S. Industrial Chemicals Company, Division of National Distillers Products Corporation, New York, N. Y.

COMPOUNDS—For Improving Drawing and Extrusion
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Electronic Rubber Company, Stamford, Conn.

COMPOUNDS—Phosphate Coating
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
American Lanolin Corporation, Lawrence, Mass.
Apex Alkali Products Co., Philadelphia, Pa.
Rome Soap Manufacturing Co., Rome, N. Y.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corporation, Brooklyn, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.

COMPOUNDS, Vinyl
Electronic Rubber Company, Stamford, Conn.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnuson Products Corporation, Brooklyn, N. Y.
Miller, R. H. Co., Inc., Homer, N. Y.
Pennsylvania Salt Mfg. Company, Philadelphia, Pa.
Rome Soap Manufacturing Co., Rome, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.
Swift & Company, Chicago, Ill.
United States Borax & Chemical Corp., Pacific Coast Borax Co. Div., New York, N. Y.

CONDUCTORS—Flexible, Electrical
Montgomery Co., The, Windsor Locks, Conn.

CONTAINERS—Wire Packaging
(See DRUMS—Wire Packaging)

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Carter & Co., Ltd., B. & F., Bolton, England.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Plastic Mold & Engineering Co., Providence, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket. R. I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

COUNTERS—
(See MACHINERY—Measuring Wire and Cable)

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Eastern Carbide Corp., New Rochelle, N. Y
Firth Sterling, Inc., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Detroit.
Vascoloy-Ramet Corp., Waukegan, Ill.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Somerville, Mass.
Robinson, M. W. Co., Rockfall, Conn.

DIAMONDS—Industrial
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Molina-Straus Diamond Products Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Danforth, The C. W. Co., Youngstown, Ohio
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
Industrial Diamond Powders, Inc., Pittsburgh, Pa.
Kelly Wire Die Corp., New York, N. Y.
Molina-Straus Diamond Products Co., New York, N. Y.
National Research Company, St. Clair Shores, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Union Wire Die Corp., New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDER RECLAIMING—
Danforth, The C. W. Co., Youngstown, Ohio
Industrial Diamond Powders, Inc., Pittsburgh, Pa.
Kelly Wire Die Corp., New York, N. Y.
National Research Co., St. Clair Shores, Mich.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Union Wire Die Corp., New York, N. Y.

DIAMOND TOOLS—
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Molina-Straus Diamond Products Co., New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Carbide, Tungsten & Tantalum
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Metallurgical Products Dept. of General Electric Co., Detroit.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.

DIES—Cold Heading
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Detroit.
Union Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., Waukegan, Ill.

DIES—Diamond
Ajax Industrial Supplies, Inc., Ft. Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
National Wire Die Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N.Y.
Union Wire Die Corp., New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES DIAMOND—Reversible
National Wire Die Co., New York, N. Y.

DIES—Extrusion
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Kelloy Corporation, New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Detroit.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc, New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Ft. Wayne Wire Die., Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Detroit.
National Wire Die Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Union Wire Die Corp., New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.

DIES—Swaging
Sjogren Tool and Mach. Co., Inc., Auburn, Mass.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Metallurgical Products Dept. of General Electric Co., Detroit.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y
Vascoloy-Ramet Corp., Waukegan, Ill.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRIVES—Electric, Adjustable Speed
The Louis Allis Company, Milwaukee, Wisc.

DRUMS—Wire Packaging
Continental Can Company, Van Wert, Ohio

DRUMS & TRAVERSES—For Cable Reels
Hubbard Spool Co., Garrett, Ind.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio.

DRYING EQUIPMENT
Carl Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.

ENGINEERS—Consulting
Insulating Mach'y—Entwistle, Jas. L., Co., Cranston, R. I.
Lubricants—Hans C. Bick, Inc., Reading, Pa.
Wire Mill—Clarence S. Arms, Worcester, Mass.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

FREQUENCY CHANGERS
The Louis Allis Company, Milwaukee, Wisc.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Galvanizing Equipment
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Co., Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., Fairfield, Conn.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Resistance Heating, Strand
Trauwood Engineering Co., The, Cleveland, O.

FURNACES—Salt Bath
Ajax Electric Co., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Strand Annealing
International Wire Products Corporation, Woodside Machinery Division, Midland Park, N. J.
Trauwood Engineering Co., The, Cleveland, O.

GAUGES—Wire Diameter, Continuous
Industrial Gauges Corporation, West Englewood, N. J.

GALVANIZING EQUIPMENT — (See MACHINERY—Galvanizing Wire)

GEARMOTORS
The Louis Allis Company, Milwaukee, Wisc.

GRINDERS—Roll
Norton Co., The, Worchester, Mass.

GUIDES—For Wire
Heany Industrial Ceramic Corp., New Haven, Conn.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HARDSURFACING ALLOYS—
(See Alloys—Hardsurfacing)

HOOKS—Pickling & Liming
Youngstown Welding & Eng'g' Co., Youngstown, Ohio

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INKS—Printing, for Insulated Wire
Kellogg Company, M. W., Chemical Manufacturing Division, Jersey City, N. J.

INSULATING MATERIALS—
Celanese Corporation of America, New York, N. Y.
Chemical Products Co., E. Providence, R. I.
duPont de Nemours Co., (Inc.), E. I., Polychemical Dept., Wilmington, Delaware
Electronic Rubber Co., Stamford, Conn.
General Electric Company, Alkanex Wire Enamel Dept., Schenectady, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Plymouth Cordage Company, Plymouth, Mass
Shawinigan Resins Corporation, Springfield, Mass.
U. S. Industrial Chemicals Company, Division of National Distillers Products Corporation, New York, N. Y.
United States Rubber Company. Naugatuck Chemical Division, New York, N. Y.

INSULATING MATERIALS—Paper (For Electric Wire Cable)
Plymouth Cordage Company, Plymouth, Mass.

LACQUERING SYSTEMS — See MACH.—Lacquering Electric Wire

LACQUERS—For Electric Wire
Chemical Products Co., E. Providence, R. I.

LAGGING—Reel
North Anson Reel Co., No. Anson, Me.

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., The, Philadelphia and Bellefonte, Pa.

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnuson Products Corporation, Brooklyn, N. Y.
Miller, R. H., Co., Inc., Homer, N. Y.
Rome Soap Mfg. Co., Rome, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Bick, Hans C., Inc., Reading, Pa.
Swift & Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Bobbin Winders
Cedar West Tool Inc., New York, N. Y.
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Braiding
Carter & Co., Ltd., B. & F., Bolton, England.
New England Butt Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Haskell-Dawes Machine Co Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Capstans and Machinery—Winding Wire)

MACHINERY— Centerless Grinding & Polishing
American Laubscher Corporation, New York, N Y.

MACHINERY—Chain Making
Nilson, A. H. Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Closing Rope
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Cold Heading
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Coil Wrapping (Paper)
McLaurin-Angier Co., Needham Heights, Mass.

MACHINERY—Copper Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
National Mach'y Exch. (Used), New York.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Cutting
Eisler Engineering Company, Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Mattler Machine Tool, Inc., New Haven, Conn.
Wells, Frank L., Co., Kenosha, Wis.

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Herborn, Germany.

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Firth Sterling, Inc., Pittsburgh, Pa.
Metallurgical Products Dept. of General Electric Co., Detroit.
Union Wire Die Corp., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio.
Michigan Oven, Company, Detroit, Mich.
Rockwell Co., W. S., Fairfield, Conn.

MACHINERY—Extruding
Davis-Standard Sales Corp., Mystic, Conn.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Entwistle Manufacturing Corporation, Providence, R. I.
Prodex Corp., Fords, N. J.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Fence

Glader, Wm., Machine Works, Chicago, Ill.

MACHINERY—Flat Wire

Fenn Manufacturing Co., Newington, Conn.
Mettler Machine Tool, Inc., New Haven, Conn.
Rockwell, W. S., Company, Fairfield, Conn.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming Wire

Baird Machine Co., Stratford, Conn.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Galvanizing Wire

Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders

Entwistle Manufacturing Corporation, Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding

Norton Co., The, Worcester, Mass.

MACHINERY—Insulating Wire

American Insulating Mach'y Co., Phila., Pa.
Davis-Standard Sales Corp., Mystic, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio.
Michigan Oven Company, Detroit, Mich.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lacquering Electric Wire

American Insulating Mach'y Co., Philadelphia.
Cook Mfg. Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, O.
Michigan Oven Company, Detroit, Mich.

MACHINERY—Lock Washer

Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving

Cedar West Tool Inc., New York, N. Y.
E. V. G., Richard Kleinhans, New York, N. Y.
Maschinen & Stahl A. G., c/o Richard Kleinhans, Zurich, Switzerland
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Material Handling

(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable

Durant Mfg. Co., Milwaukee, Wis.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack

Baird Machine Co., The Stratford, Conn.
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Packaging Wire

Coulter & McKenzie Machine Co., Bridgeport, Conn.

MACHINERY—Pickling

Youngstown Welding & Eng'g Co., Youngstown, Ohio.

MACHINERY—Pin Making

Baird Machine Co., The, Stratford, Conn.

MACHINERY—Plating

Universal Industrial Equipment Co., Secaucus, N. J.

MACHINERY—Pointing

Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York,
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury Conn.

MACHINERY—Printing on Electric Wire

Gillies, Duncan M. Co., Inc., Boylston, Mass.

MACHINERY—Pumps for Molten Metal

Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Re-Spooling

Emory, Robert J., Co., Newark, N. J.
Federal Manufacturing Company, Wallingford, Conn.
International Wire Products Corp., Woodside Machinery Division, Midland Park, N. J.
National Mach'y Exch. (Used), New York,
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.
Wire Insulating Machinery Inc., Northboro, Mass.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Rod Mill

Fenn Manufacturing Co., Newington, Conn.
Morgan Construction Co., Worcester, Mass.

MACHINERY—Rolling Mill

Fenn Manufacturing Co., Newington, Conn.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Insulating

Davis-Standard Sales Corp., Mystic, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio.
Royle, John & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Serving

Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Spark Testing

Entwistle, Jas. L., Co., Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Peschel Electronics, Inc., New Rochelle, N. Y.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spring Making

National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Staple

Nilson, A. H. Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Straightening & Cutting

Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Patterson Machine, Geo. C., Co., Cleveland, Ohio.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding

Carter & Co., Ltd., B. & F., Bolton, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Stripping Electric Wire & Cable

Burdwood, Howard A., Inc., Portland, Mass.

MACHINERY—Swaging

Fenn Manufacturing Co., Newington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out

American Insulating Mach'y Co., Phila., Pa.
Davis-Standard Sales Corp., Mystic, Conn.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Fenn Manufacturing Co., Newington, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
International Wire Products Corporation, Woodside Machinery Division, Midland Park, N. J.
Litzler, C. A., Co., Inc., Cleveland, Ohio.
Standard Mill Supply Co., Pawtucket, R. I.
Trauwood Engineering Co., The, Cleveland, O.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Taping

American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing Magnet Wire Coatings for Pin Holes

Peschel Electronics, Inc., New Rochelle, N. Y.

MACHINERY—Testing, Physical

Scott Testers, Inc., Providence, R. I.

MACHINERY—Tinning Wire

American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
International Wire Products Corporation, Woodside Machinery Division, Midland Park, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Universal Industrial Equipment Co., Secaucus, N. J.

MACHINERY—Tinsel Rolling Mills

American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire

Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill, Cold Drawing

Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Turks Head

Fenn Manufacturing Co., Newington, Conn.

MACHINERY—Twinning

(See Mach.—Bunching)

MACHINERY—Twisters, Wire

Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used

National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—Welded Wire Mesh

E. V. G., Richard Kleinhans, New York, N. Y.
Maschinen & Stahl A. G., c/o Richard Kleinhans, Zurich, Switzerland

MACHINERY—for Wire Welding

(See WELDERS—Butt and Spot and Machinery—Welding Wire Fabrics)

MACHINERY—Winding Wire

Emory, Robert J., Newark, N. J.
Federal Manufacturing Company, Wallingford, Conn.
Fenn Manufacturing Co., Newington, Conn.
Hobbs Manufacturing Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.
Wire Insulating Machinery Inc., Northboro, Mass.

MACHINERY—Wire Drawing

Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Fenn Manufacturing Co., Newington, Conn.
Herborn, Herborn, Germany
International Wire Products Corporation, Woodside Machinery Division, Midland Park, N. J.
Morgan Construction Co., Worcester, Mass.
Morgardshammers Mek Verstads AB, Morgardshammer, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

MACHINERY—Wire Forming
Baird Machine Co., The, Stratford, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
Carter & Co., Ltd., B. & F., Bolton, England.
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
Larmuth (1947) Ltd., Swinton, England
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MOTORS—Electric, A. C. & D. C.
The Louis Allis Company, Milwaukee, Wisc.

NAIL TOOLING—Tungsten Carbide
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Brothers, Inc., Cortland, N. Y.

NIPPERS—Wire Cutting
Robinson, M. W. Co., Rockfall, Conn.

NOZZLES—For Extruding Machines
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

OVENS—Cable Lacquering and Enameling
American Insulating Mach'y Co., Phila., Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio.
Litzler, C. A., Co., Inc., Cleveland, Ohio.
Michigan Oven Company, Detroit, Mich.
Rockwell Co., W. S., Fairfield, Conn.

OVENS—Rod Bakers
Carl Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio.

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAPER—Creped Wrapping
Arkell Safety Bag Company, New York, N. Y.
McLaurin-Angier Co., Needham Heights, Mass.
National Waterproof Papers, Inc., Beverly, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Arkell Safety Bag Company, New York, N. Y.
McLaurin-Angier Co., Needham Heights, Mass.
National Waterproof Papers, Inc., Beverly, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—Insulating
Plymouth Cordage Company, Plymouth, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Youngstown Welding & Eng'g Co., Youngstown, Ohio.

PLASTICIZERS—
Celanese Corporation of America, New York, N. Y.
Monsanto Chemical Company, Plastics Division, St. Louis, Mo.

PLASTICS COMPOUNDING — Custom
Electronic Rubber Company, Stamford, Conn.
Plandex Corporation, Downingtown, Pa.

PLASTICS—for Wire Insulation
Celanese Corporation of America, New York, N. Y.
duPont de Nemours Co., (Inc.), E. I., Polychemical Dept., Wilmington, Delaware
Electronic Rubber Co., Stamford, Conn.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Plandex Corporation, Downingtown, Pa.
Shawinigan Resins Corporation, Springfield, Mass.
U. S. Industrial Chemicals Company, Division of National Distillers Products Corporation, New York, N. Y.
United States Rubber Company, Naugatuck Chemical Division, New York, N. Y.

POINTING WIRE
Main, Robert A. & Sons, Inc., Paramus, N. J.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

PRINTING WHEELS—for Electric Wire
Gillies, Duncan M. Co., Inc. Boylston, Mass.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

PUMPS—Molten Metal
Fisher Associates, New York, N. Y.

REEL AND TENSION STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Synoro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company The, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio.

REELS—Metal Bound
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
North Anson Reel Co., No. Anson, Me.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REELS—Plywood
Carris Reels, Inc., Rutland, Vt.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
Nelson Company, The, Baltimore, Md.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company The, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L. Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., New York, N. Y.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company The, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Mason Can Co., East Providence, R. I.
McCaskie, Inc., William, Westport, Mass.
Mettler Machine Tool, Inc., New Haven, Conn.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Company, New York, N. Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
North Anson Reel Co., No. Anson, Me.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wood
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
Nelson Company, The, Baltimore, Md.
North Anson Reel Co., No. Anson, Me.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Crucible Steel Co. of America, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Chase Brass & Copper Co., Waterbury, Conn.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Titan Metal Manufacturing Co., Bellefonte, Pa.

RODS—Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—RUST Preventing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—(See Reels & Spools)

SPOOLS—Braider, Wire
Plastic Mold & Engineering Co., Providence, R. I.

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Company, East Providence, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TESTERS — INSULATION
(See MACHINERY—Spark Testers)

TESTING EQUIPMENT
(See MACHINERY Testing, Physical and Diameter Testing)

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.
Wire Equipment Mfg. Co., Trenton, N. J.

TOOLS—Wire Cutting
Porter, H. K., Inc., Somerville, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRANSMISSIONS—Variable speed (See Adjustable Speed Drives)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

VARNISHES & LACQUERS—for Electric Wire
Chemical Products Co., E. Providence, R. I.
General Electric Company, Alkanex Wire Enamel Dept., Schenectady, N. Y.
Shawinigan Resins Corporation, Springfield, Mass.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Litzler, C. A., Co., Inc., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire Insulating Machinery Inc., Northboro, Mass.

WELDERS—Spot and Butt and Welding Wire Fabrics
Eisler Engineering Corp., Newark, N. J.
Micro Products Co., Chicago, Ill.

WIRE—Aluminum
International Wire Products Corporation, Woodside Machinery Division, Midland Park, N. J.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Barbed
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

WIRE—Brass and Bronze
Chase Brass & Copper Co., Waterbury, Conn.
International Wire Products Corporation, Woodside Machinery Division, Midland Park, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Titan Metal Manufacturing Co., Bellefonte, Pa.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Bunched & Stranded, Copper
Camden Wire Co., Camden, N. Y.
International Wire Products Corporation, Woodside Machinery Division, Midland Park, N. J.

WIRE—Cadmium
Stamford Processing Co., Peekskill, N. Y.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Camden Wire Co., Camden, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind
Crucible Steel Co. of America, Pittsburgh, Pa.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
Titan Metal Manufacturing Co., Bellefonte, Pa.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Camden Wire Co., Inc., Camden, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
International Wire Products Corporation, Woodside Machinery Division, Midland Park, N. J.
United Wire & Supply Corporation, Providence, R. I.

WIRE—For Electrical Conductors
Camden Wire Co., Camden, N. Y.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Flat, Fine
Montgomery Co., The, Windsor Locks, Conn.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Galvanized
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
National Standard Company, Niles, Mich.
Roebling's, John A. Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Manufacturers
Alloy Metal Wire Div., H. K. Porter Company, Inc., Prospect Park, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark, N. J.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
Titan Metal Manufacturing Co., Bellefonte, Pa.
United Wire & Supply Corporation, Providence, R. I.
U. S. Steel Corp., N. Y., N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Metalizing
Stamford Processing Co., Peekskill, N. Y.

WIRE—Music
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio
National-Standard Company, Niles, Mich.
Worcester Wire Works Div., National-Standard Company, Worcester, Mass.

WIRE—Needle
Carpenter Steel Company, Webb Wire Division, New Brunswick, N. J.

WIRE—Nickel Alloy
Carpenter Steel Company, Webb Wire Division, New Brunswick, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Alloy Metal Wire Div., H. K. Porter Company, Inc., Prospect Park, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
International Wire Products Corporation, Woodside Machinery Division, Midland Park, N. J.
Malin & Co., The, Cleveland, Ohio
Titan Metal Manufacturing Co., Bellefonte, Pa.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Oil Tempered
Crucible Steel Co. of America, Pittsburgh, Pa.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Pointed
Main, Robert A. & Sons, Inc., Paramus, N.J.

WIRE—Silver Plated Copper
Camden Wire Co., Camden, N. Y.
International Wire Products Corporation, Woodside Machinery Division, Midland Park, N. J.

WIRE—Special Shapes
Alloy Metal Wire Div., H. K. Porter Company, Inc., Prospect Park, Pa.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
Titan Metal Manufacturing Co., Bellefonte, Pa.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Spring
Alloy Metal Wire Div., H. K. Porter Company, Inc., Prospect Park, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J
Sheffield Steel Corp., Kansas City, Mo.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Carpenter Steel Company, Webb Wire Division, New Brunswick, N. J.
Crucible Steel Co. of America, Pittsburgh, Pa.
Firth Sterling, Inc., Pittsburgh, Pa.
International Wire Products Corporation, Woodside Machinery Division, Midland Park, N. J.
National Lock Washer Company, The, Newark, N. J.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Steel—Also Coppered and Galvanized Steel
Alloy Metal Wire Div., H. K. Porter Company, Inc., Prospect Park, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N J.
Sheffield Steel Corp., Kansas City, Mo.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Tinned Copper
Camden Wire Co., Camden, N. Y.
International Wire Products Corporation, Woodside Machinery Division, Midland Park, N. J.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WOOD—for Guide, Rolls, Bushings, Wear Parts, etc.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARNS & TAPES—Insulating
Celanese Corporation of America, New York, N. Y.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE, WIRE ROPE, CORDAGE AND MASTICATING MACHINERY MANUFACTURERS

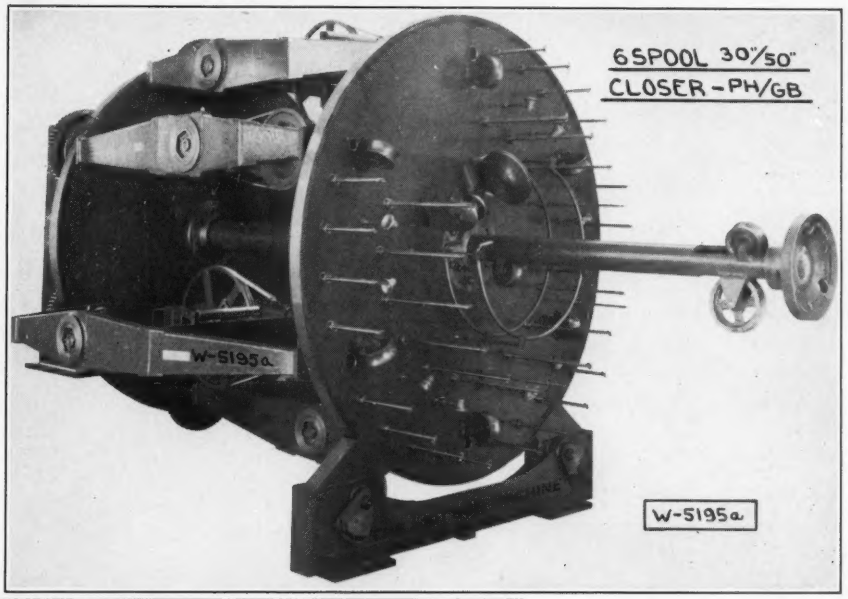
WATSON

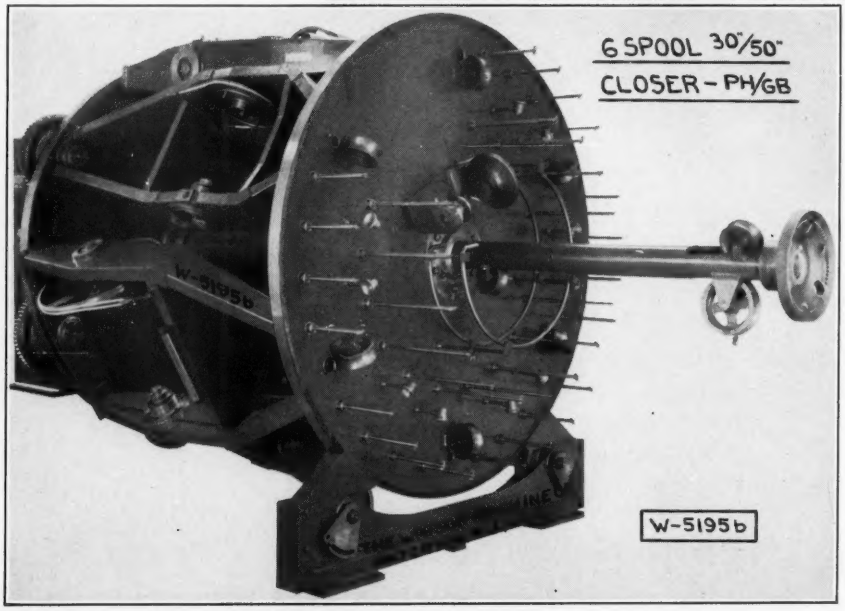
6 SPOOL 30"/50" CLOSER TYPE PH/GB

U. S. PATENT 2,270,093

THE OUTSTANDING FEATURE OF THIS ELECTRIC CABLE CLOSING HEAD IS THE BACK-TURN MECHANISM OF NEW DESIGN WHICH PERMITS IN SECONDS, BY CHANGE OF HYDRAULIC "POP-OFF" GEARS, CONVERSION FROM RIGID FRAME TO PLANETARY OPERATION AND VICE VERSA.

OTHER ADVANTAGES ARE: DE-CLUTCHABLE CRADLES OF PATENTED, "SHAFT-LESS," NO-LOOSE-PARTS DESIGN WHICH SAVE LOADING TIME AND TO-TALLY ELIMINATES REEL SIDE-SLAP.



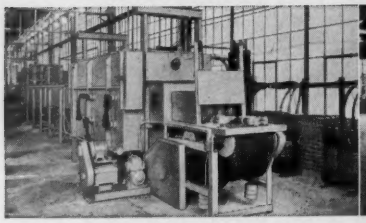


THE UNIT SHOWN LOADS THREE 50" AND THREE 30" REELS IN STAGGERED CRADLES. CONSTRUCTION IS ALL STEEL AND ANTI-FRICTION BEARING. MAIN DRIVE IS FORCE-FEED LU-BRICATED. CUTS SHOW BOTH PLANETARY AND RIGID FRAME SETTINGS.

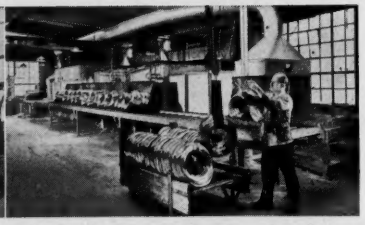
REQUEST INFORMATION FOR FURTHER DETAILS.

10-56

V 3 1 / 1 0

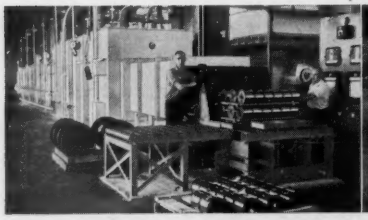


EF belt conveyor furnace bright annealing coiled alloy steel and non-ferrous wire.



EF continuous roller rail pusher furnace, bright anneals large reels and coils of wire.

designed engineered and



This furnace bright anneals wire on reels, spools, and coiled. Capacity 4000 lbs. per hr.

Stainless steel wire is bright annealed continuously in these EF multiple tube furnaces.

Specially Built

to meet the WIRE INDUSTRY'S requirements

Charging end of EF special atmosphere bulkhead pusher furnace; bright anneals copper and copperweld wire and clean anneals brass wire. Capacity 4000 lbs. per hr.

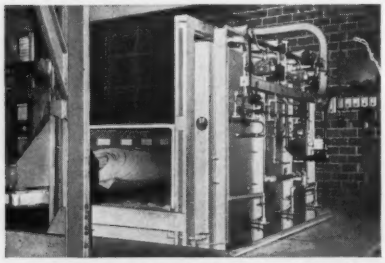
• We build production furnaces for heat processing all kinds of wire, rod, or other products — in any shape or form.

Years of practical experience in designing and building successful heat treating equipment for the wire industry enable us to furnish the best type of equipment for any purpose — and to produce the results required.

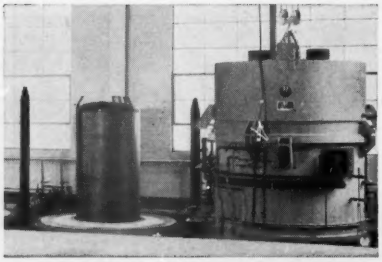
Shown here are 8 more production installations we made in prominent wire plants. We receive many repeat orders.

Submit your production furnace problems to experienced EF engineers — it pays.

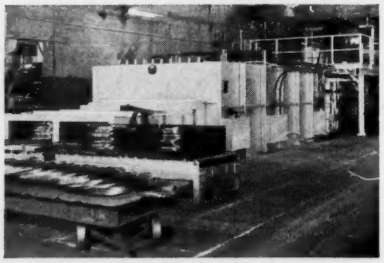
THE ELECTRIC FURNACE CO.
GAS FIRED, OIL FIRED AND ELECTRIC FURNACES FOR ANY PROCESS PRODUCT OR PRODUCTION
Salem - Ohio
Canadian Associates • CANEFCO LIMITED • Toronto 1, Canada



EF direct gas fired, single end, forced circulation hearth type annealing furnace with gantry crane for handling large coils of cupro nickel wire and brass rod.



EF direct gas fired bell type furnace with retorts and 4 forced circulation bases, used for bright annealing both ferrous and non-ferrous flat coiled wire.



EF special atmosphere continuous bright annealing furnace in which the wire is conveyed through the various zones on two parallel rows of bulkhead type trays.

0 C 5 6 UMI